

Volume 28, Number 1
Spring 2010

NORTHEAST SUN

The Magazine of the Northeast Sustainable Energy Association

- **Structural Engineer: Friend or Foe?**
- **Interview: NESEA's Next Generation**
- **Cape & Islands Energy Technology Strategy**
- **Solar Thermal: A New Sustainable Solution for Urban Multi-Family Buildings**
- **Sustainable Waste Management for Residential Construction Sites**
- **BuildingGreen Announces 2009 Top-10 Products**



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NORTHEAST SUN

Volume 28, Number 1 • Spring 2010

The Northeast Sustainable Energy Association (NESEA) is the Northeast's leading organization of professionals working in sustainable energy, whole systems thinking and clean technologies. NESEA advances the adoption of sustainable energy in the built environment. NESEA accomplishes this through its Building Energy Conference and Trade Show, professional workshops, K-12 resources, an advocacy network, high profile public events such as the Green Buildings Open House, its chapters and members, and its Sustainable Green Pages Directory.

Northeast Sun is published by NESEA and is the major regional magazine promoting responsible use of energy for a stronger economy and cleaner environment. The magazine is a direct outgrowth of the *NESEA Newsletter*, published 1974–1982, and the *MASEA Solar News*, published 1977–1982. *Northeast Sun* is distributed to members of NESEA. Subscription: \$55/year, includes NESEA membership. No part of this publication may be reproduced without permission. Copyright 2010 by the Northeast Sustainable Energy Association.

EDITORIAL COMMITTEE

Chris Benedict
David Gerratt
Luke Falk
Joel Gordes
Lucia Green-Weiskel
Jo Lee
Jennifer Marrapese

EDITOR

Lucia Green-Weiskel

DESIGN & PRODUCTION

David Gerratt/NonprofitDesign.com

PUBLISHER

Jennifer Marrapese

Northeast Sustainable Energy Association

50 Miles Street, Greenfield, MA 01301
Tel. 413-774-6051 • Fax 413-774-6053
Online at www.nesea.org



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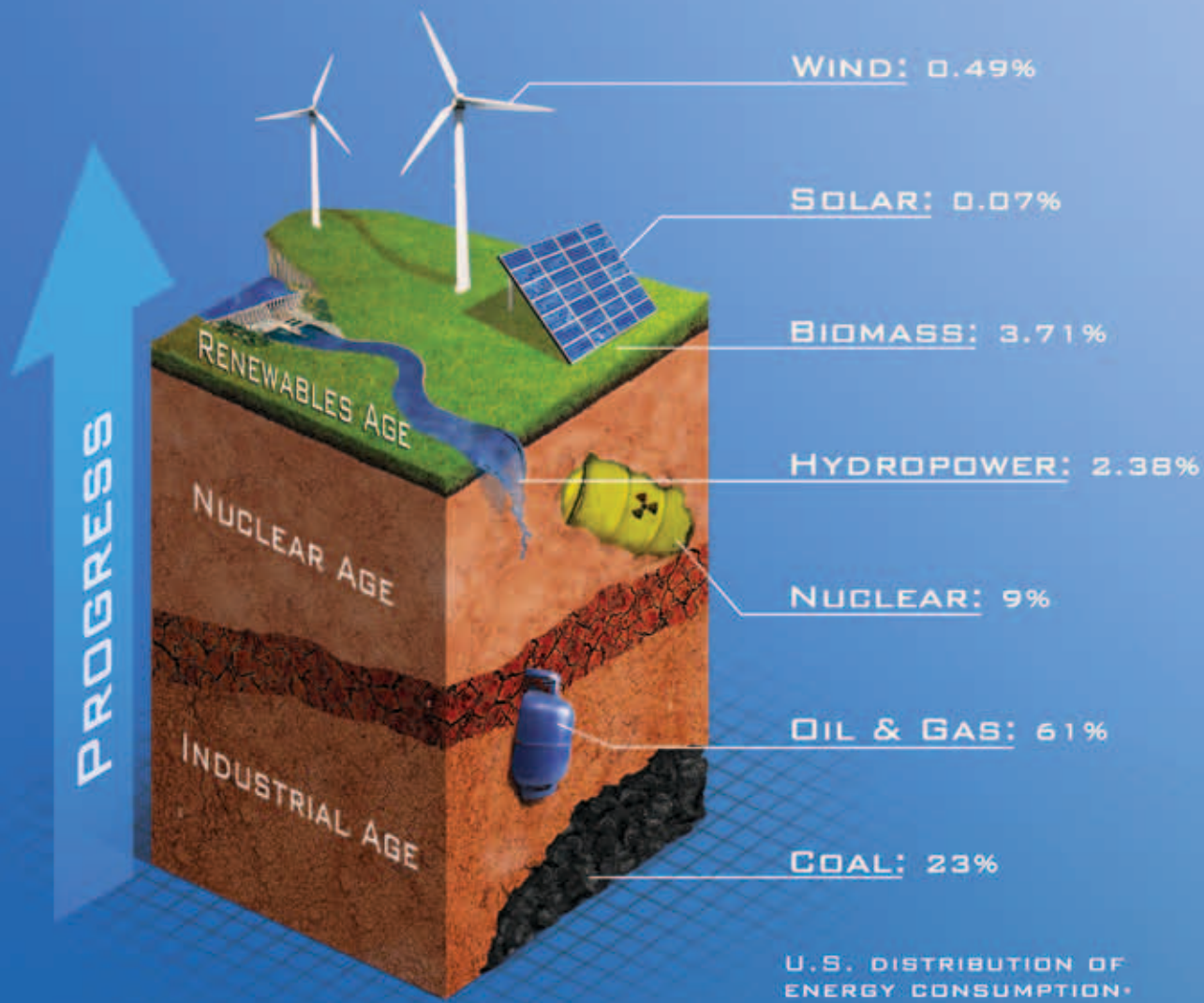
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On the Cover

The cover residence is one of the entrants in the NESEA 2010 Zero Net Energy Building Award Competition. The super-efficient building, designed and built in eight months by the owners and a carpenter, generates more energy than it uses. It will be eligible, along with several other entries, to compete for a \$10,000 cash prize, which will be awarded during the Plenary Session of BE10.

Photo © Douglas A. Stephens



For 2,000 years,
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April 16 & 17, 2010 at Tufts University
Registration opens February 15th. www.TuftsEnergyConference.com

*Source: U.S. Energy Information Administration





A Warm Welcome



It has been a great honor and an exciting challenge to join NESEA as Interim Executive Director. I'm extremely impressed by the dedication and depth of knowledge of the staff. In the five months since I've been with NESEA, I have spent most of my time getting to know them and developing a strong sense of NESEA and the services that the organization offers. The next step is meeting more of the members and learning more about their businesses and how we can help them grow this industry. BE10 will

provide the perfect forum for this. It's a really exciting time for NESEA and presents great opportunities to grow.

If you have been a longtime reader of the *Northeast Sun*, you may notice some changes in this issue—among them:

- For the first time, the entire magazine appears in four-color, which allows us to provide a better visual showcase of the work our members do;
- The content is more member-driven than in the past:

We issued an open call for article proposals to ensure that the articles contained here truly reflect the broad scope of work NESEA members are involved with; and

Rather than continuing to speculate on what our 20- and 30-something members want, we have asked them (see "Interview" on p.12);

- The layout has been streamlined to make the content more readable and the appearance more appealing; and
- We have welcomed two new members to our editorial committee—Luke Falk, who is featured in our young NESEA-ites story, and David Gerratt, who has worked with us for many years on design and production of the magazine.

These changes signal more and bigger developments on the horizon for NESEA. The NESEA board and staff have just begun to work with Mitch Anthony, of Titanium, to develop a strategic plan, which, if successful, will ensure that NESEA is a vibrant, sustainable organization amidst the vast, proliferating sea of "green" organizations. It will also help ensure that we have an array of programs that fill an important market niche and align with our mission. I look forward to updating you on our progress, and enlisting your help implementing the plan that results from it!

— Jennifer J. Marrapese
Interim Executive Director

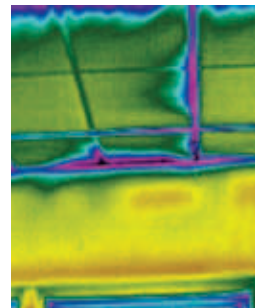


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www.nesea.org

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BuildingEnergy10, March 9–11, 2010. Reduce, Retrofit, Renew

Generating truly new ideas in the world of sustainability requires whole systems thinking, a cross-disciplinary approach, and rigorous standards for content and case studies. This idea is at the heart of **NESEA’s BuildingEnergy Conference March 9–11, 2010, at the Seaport World Trade Center in Boston, MA.** BuildingEnergy is the only conference where architects, designers, planners, builders, policymakers, manufacturers, and installers work together to determine what’s possible. This year’s theme: Reduce, Retrofit, and Renew. Conference sessions range from emerging trends in renewable energy to deep energy retrofits of commercial and residential buildings. The Trade Show features 160 exhibitors with the next generation of sustainable technologies and products. There is no better place than this to network with the professionals in sustainability and whole systems thinking.

Special thanks to our conference chair, Betsy Pettit of Building Science Corporation, our vice chair, Bruce Coldham of Coldham and Hartman Architects, and all our track chairs and planning committee members who collaborated on this rich array of conference sessions. Thanks also go out to our sponsors, exhibitors, NESEA members, staff, and friends who help spread the word that this conference is known to be the best opportunity for high quality professional development in the area of renewable energy sources and sustainable building practices. If you can’t make it this year, save the date for next year: March 8–10, 2011.

—Mary Biddle

NESEA K-12 Education Department

The NESEA K–12 Education Department offers professional development opportunities, curriculum, and resources for teachers and non-formal educators on energy efficiency, energy conservation, and on the science and applications of renewable energy.

The **Junior Solar Sprint (JSS)** is a model solar electric car program geared toward middle school students. With sponsorship from the United States Army Educational Outreach Program (AEOP), NESEA coordinates this program throughout the Northeast. Throughout this spring NESEA and its JSS Area Coordinators facilitate free workshops to teachers and non-formal educators on applications in solar energy with hands-on experience in learning how to build a mini solar car. Workshops are designed to help prepare educators in leading middle school students through Junior Solar Sprint, where kids design, build and compete with model solar electric cars. These young engineers deepen their understanding about Science, Technology, Engineering, Mathematics (STEM), solar energy, and craftsmanship. Teams can enter their cars in local design and race competitions with top winners invited to NESEA’s annual championship, Sunday, June 13 in Springfield, MA. For more information on JSS resources and upcoming workshops throughout the Northeast, visit JSS at www.nesea.org/k-12/junior-solarsprint.

Solar Sails New York: Expansion of Solar and Wind Energy Education for School Power...Naturally, sponsored by the New York State Energy Research and Development Authority (NYSERDA), is a professional development project for K–12 New York State teachers. Attend a workshop and receive a free educational kit! Test out the experiments and give your students the tools they need to understand solar and wind technolo-

gies. “A Solar Kit for the Classroom” is suitable for teachers who work with grades 3–12. Solar energy lessons support NYSERDA’s School Power...Naturally 15 Solar Kit lessons. Free downloads of lessons available at www.SchoolPowerNaturally.org. “Wind Wisdom” is suitable for teachers who work with grades K-6. Hands-on activities support the accompanying curricular units *Wind Wisdom for School Power Naturally* (K–4 & 5–6). Free downloads of the units are also available at www.nesea.org/k-12/solarsailsnewyork. For a listing of workshops, go to www.nesea.org/k-12/events.

Arianna Grindrod appears in international teachers’ magazine:

The Winter 2010 issue of *Green Teacher* includes Arianna’s article and lesson plan “Acting Out Energy Forms”. To view the lesson, follow the link www.nesea.org/k-12/curricularunits and scroll to Energy Thinking. This activity has been a hit at environmental education conferences. For more excellent teacher lesson plans and resources, visit Green Teachers at www.greenteacher.com.

What teachers are saying about NESEA educator workshops:

“The presenter was knowledgeable, answered questions well, and spoke clearly. It was nice to get into small groups for hands-on activities.”
—Buffalo, NY

“Great lesson plans and materials to present the lessons! What a wonderful gift for teachers.”
—Wynantskill, NY

“Very informative, well organized, fun...I am charged!”
—Baltimore, MD

“Presenter’s enthusiasm was contagious! She explained wind in simple terms; good activities.”
—Worcester, MA



Volunteerism: The NESEA K-12 Education Department gratefully accepts volunteers to help staff organize and assemble kits and workshop packets, research outreach opportunities and promotional venues, perform data entry, and help out at events, particularly

at JSS area races and the Northeast Championship. Contact the Education Department at 413-774-6051 x 21 or email agrindrod@nesea.org for more information on how you can get involved!
—Arianna Grindrod

NESEA's Green Buildings Open House

On October 3, 2009, more than 15,000 people toured over 500 Green Buildings Open House sites throughout the Northeast, including homes, businesses, and public buildings. Seventy-one local volunteer organizers, including representatives from NESEA chapters and local and regional energy organizations, collaborated with NESEA to promote this event through media organizations in their area. Participants are able to talk with others who have implemented energy efficiencies and renewable energy technologies and see how these solutions are used in working homes and other buildings. GBOH also connects homeowners with professionals in energy efficiency and renewable energy who can answer questions and provide sustainable energy services.

A study by the American Solar Energy Society found that participation in this program increased the likelihood that attendees would invest in energy efficiency and/or clean energy measures by 24%, from 54% to 78%, matching our goal of bringing these measures into everyday use. Sixty-six percent of 2009 tour hosts indicated that they were opening up their homes or buildings for the first time; 91% of 2009 tour hosts plan on participating in the 2010 tour. Ninety-seven percent of 2009 tour organizers indicated that they will be managing a tour this year.

With an earlier registration process for host sites in 2010 and more lead time for volunteer organizers, I anticipate greater numbers of participants and open houses to be available for the 2010 NESEA Green Buildings Open House Tour on October 2, 2010. We have been upgrading our online website host registration, which will be available in February. This will allow the public to view online portraits of host site energy features throughout the year. New for 2010, hosts will be given a tote bag (made from renewable materials) as a thank you for their help in the tour; it will also serve to promote the tour in future years.

I would like to sincerely thank the 2009 hosts and organizers for making the tour last fall a tremendous success. In addition, we would not have been so successful without the generosity of our sponsors. The title sponsor for Green Buildings Open House was the Massachusetts New Homes with ENERGY STAR® Program. GBOH was sponsored by Alteris Renewables; Efficiency Maine, a Division of the Maine Public Utilities Commission; National Grid; and New York State Energy Research and Development Authority (NYSERDA). GBOH media partners included CSWire, E-The Environmental Magazine, Environmental Design + Construction, Green Builder Media, Green Living Journal, GreenRetros, High-Profile Monthly, metrogreenbusiness.org, New Jersey & Co., the New England Real Estate Journal, New York House, and Smart HomeOwner.

Please join us in 2010 as a visitor, host, organizer and/or sponsor. Please check the website for more information at: www.NESEA.org.

—Pamela J. Lester, Program Manager

Sustainability Workshops

NESEA is pleased to announce its Spring 2010 Sustainability Workshop Series scheduled to run from February–May. An exciting new element to the Sustainability Workshops this year is NESEA's affiliation with the Affordable Comfort, Inc. (ACI) Regional Conferences in NESEA's territory. The Sustainability Workshops will be held on the day prior to the ACI Conferences: on February 9 in Saratoga Springs, NY, on March 3 in Atlantic City, NJ, and on October 5 in Sturbridge, MA at the *ACI New England Conference*. NESEA's Sustainability Workshop series serves professionals by broadening their knowledge on a wide range of critical topics that focus on three core elements: sustainable solutions, proven results and cutting-edge development in the field. Each workshop is accredited by AIA, BOMI, NACHI, NAHB, and NARI. Attendees receive seven continuing education units for each full day workshop and three continuing education units for a half day workshop. Also new this year is the addition of the BPI accreditation which offers CEU's for four of the Sustainability Workshops.

Each instructor of the series is an active NESEA member and has played an important role in advancing the mission of NESEA by offering real solutions to critical building questions. Collectively, the instructors have many years of experience designing, building and retrofitting energy efficient homes and buildings.

Registration is limited and is taken on a first come, first served basis. If your company or organization is interested in being a Sponsor of the Sustainability Workshop Series for the Spring and/or Fall series, please contact Pamela Lester at plester@nesea.org or phone 413-774-6051 x14. ■

—Pamela J. Lester, Program Manager



Building for Social Responsibility (BSR), Vermont

**BSR is proud to present:
The 2010 Solar Hot Water Series!**

From March 20, 2010 through October 16, 2010 workshops are available across the state. These courses are recognized by Renewable Energy of Vermont (REV) as credits towards applying for Solar Thermal Partnership. BSR encourages all builders, plumbers and anyone interested to jump start their ability to offer SHW services by signing up for the two day REV approved workshops. These workshops are intended for:

- **BUILDERS** who want to expand their business and generate more income by offering clients solar hot water services. This two day workshop also

leads to Solar Thermal Partnership which is a requirement to access state incentives;

- **PLUMBING AND HEATING CONTRACTORS** who want to learn the specifics of solar installations for domestic hot water and heating systems;
- **ANYONE INTERESTED** in expanding their knowledge of a sophisticated renewable technology.

Contact BSR for more information. www.BSR-VT.org, 802-825-5957 or buildvermont@gmail.com. Join today—we can't wait to meet you!

CIRenew Participants Look Offshore

Through the “Beyond Cape Wind” community planning process, diverse stakeholders agreed upon a consensus statement outlining a vision of success for offshore renewable energy development, as well as recommendations for coordinated, participatory, community-based decision-making focused on localizing benefits. The consensus statement was delivered to government officials and agencies involved in planning, siting, permitting, and approval of future offshore projects in state and federal waters. Several recommendations have already been addressed, while the vision of success provides guidance as regional agencies begin to develop siting criteria under the Massachusetts Ocean Management Plan.

Recent monthly CIRenew membership meetings featured Dave McGlinchey of the Vineyard Energy Project introducing the community-based approach to offshore wind development being pursued by Vineyard Power; Dan Wolf, Jim Wolf, and Bob Doane of Cape Air discussing the challenges and opportunities associated with greening an airline. Neil Seldman from the Institute for Local Self-Reliance talked about zero-waste concepts and practices, and author and activist Harvey Wasserman discussed visions for a “Solartopia.”

In a local installment of NESEA’s Sustainability Workshop series, Paul Eldrenkamp presented “Deep Energy Retrofits” at the Woods Hole Research Center (WHRC) in Falmouth. Following Paul’s detailed and compelling workshop, participants were treated to a tour of the WHRC’s retrofit project by John Abrams of South Mountain Company.

Barnstable County’s Clean Energy Training Program—a partnership involving Cape Cod Economic Development Council, Cape and Islands Self-Reliance Corp, Mid-Cape Home Centers, Shepley Wood Products, and more than 30 local employers—completed the first year of a three-year Workforce Competitiveness Trust Fund grant. Several six-week classes topped off by hands-on installation workshops were filled to capacity in the areas of energy efficiency, solar thermal, and solar PV. Year two of the program began with a 12-week PV course consistent with entry-level National Association of Board Certified Energy Practitioners (NABCEP) learning objectives.

Self-Reliance and the Coastal Training Program at Waquoit Bay Reserve continued their wind and energy efficiency workshop series for municipal staff and town committee members, experimenting with webinar offerings that proved highly successful.

For information on upcoming CIRenew meetings and initiatives, check www.cirenw.org.

It Has Been a Big Year at GreenHomeNYC!

We have tripled our roster of volunteers in the last year and now have 25 talented and committed people working hard on our programs.

We continue to host well-attended, informative and inspiring Green Building Forums every month with topics ranging from “Green Building 101” to “Greening the Building Code” and now offer AIA continuing education credit

Building for Social Responsibility BSR
is proud to present:
**Solar Hot Water Workshops
2010 Dates & Locations**

February	25 th	One	Burlington, Vermont	Barn - Spn, Lunch Included @ Vermont Energy Investment Corp
March	1 st	Two	Montpelier, Vermont	Barn - Spn, Lunch Included @ North Branch Nature Center
April	3 rd	One	White River Jct, VT	Barn - Spn, Lunch Included @ Coolidge Hotel
May	15 th	Two	Brattleboro, Vermont	Barn - Spn, Lunch Included @ Brattleboro Savings & Loan
June	24 th	One	Manchester, Vermont	Barn - Spn, Lunch Included @ Pit Mills
July	7 th	Two	Randolph, Vermont	Barn - Spn, Lunch Included @ Vermont Technical College
August	5 th	One	Montpelier, Vermont	Barn - Spn, Lunch Included @ I.S.D.
September	18 th	Two	Burlington, Vermont	Barn - Spn, Lunch Included @ Vermont Energy Investment Corp

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for many of our forums. We were especially proud to launch The First Annual Patty Noonan Memorial Policy Roundtable in cooperation with NYU Wagner and NYU Gallatin, in honor of the late Patty Noonan. We decided that one Open House Tour was not enough, so we organized two during the year—in the spring and fall—which included bus and bike tours. Both events were terrific successes.

We continue to deepen our relationship with NESEA and NESEA members and as the New York City NESEA Chapter will be producing three master workshops in collaboration with NY Designs at LaGuardia Community College.

We have added new programs. Our Green Career Transitions team has hosted three meet-ups and is running workshops and events for people looking to make a career transition. We have also continued to develop our House Calls program for co-op boards. We have added two board members and assembled an advisory board composed of green building professionals to advise and aid our volunteers.

Finally, we have expanded our website and will continue to grow it into a place to find valuable content, such as events, resources and blog posts on green building policy. Please visit us at www.nesea.org/greenhomenyc.

MeSEA Facilitates PV Assembly Workshops

The Maine Solar Energy Association (MeSEA) has had two exciting developments this fall in PV assembly workshop seminar programs: a two day workshop at University of Dayton, Dayton, Ohio and a one day workshop at Burdin Renewable Energy of Dexter, Maine. In September, Dr. Richard Komp and John Burke fulfilled planned PV workshop with engineering students in Ohio. Many of the engineering students at U. of Dayton have spent time working



Engineering student group at University of Dayton, Ohio, show off 60 watt PV module after assembly workshop with Maine Solar Energy Association, September, 2009.

with Suni Solar, S.A., and the Grupo Fenix, in Nicaragua, through the ETHOS Program, where U. of Dayton engineering students work with engineering projects in the developing world. This affiliation is through the National Engineering University, Managua, Nicaragua.

The 45 engineering students participated in assembling two 60-watt PV modules from scratch, utilizing Evergreen Solar cells and the liquid silicon, capillarity encapsulation process, developed in Nicaragua, by Marco Antonio Perez Lopez, of Grupo Fenix and Suni Solar. The students were also treated to technical lectures on the photovoltaic process and solar PV “cottage industry” in the developing world by Dr. Komp. The engineering students were enthused enough to gather the necessary supplies to start making more of the “handmade” PV modules for testing and use at the U. of Dayton campus.

The Dexter, Maine PV workshop, at Burdin Renewable Energy, was held in October with Dr. Komp and John Burke of MeSEA. This one-day PV assembly workshop was attended by a group of 15 enthusiastic participants, some of which were setting up a Dexter area PV manufacturing and installation business. The Coop Ext. Service of the U. of Maine has been involved with this and other groups working on solar installations in Maine.

This interest is mirrored in the work going on in other parts of Maine and other countries. Dr. Komp and associates in Maine have presented more PV and solar thermal workshops that were well attended last year. This coming spring will be a busy season for the do-yourself-solar workshop programs. We would like to help other chapters get involved with this solar outreach strategy. Please contact www.mainesolar.org.

NHSEA Presents to the NH House Science and Energy Committee

NHSEA Board president, Clay Mitchell, was invited to speak to the New Hampshire House of Representatives, Science Technology and Energy Committee. The focus of Clay’s presentation was a series of creative strategies that make renewable energy systems more affordable with fewer (and in some cases no) upfront costs. The message was clear: NHSEA is here to promote sustainable and renewable energy that is accessible to all New Hampshire residents, but we need the cooperation of our policy makers and major utilities to provide that access and achieve true market transformation.

continued on page 11

What is Your Home's Fuel Mileage?

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Calling All New Hampshire-based Sustainable Energy Vendors and Installers!

NHSEA has partnered with New England Carbon Challenge to create the Vendor & Incentives index (working title). This index takes energy resources from across the web and gathers them into a single searchable web tool. The result is a customized report—tailored to the eligibility and interests of the participant—detailing all the federal, state and utility incentives, as well as rebate and financing options available for residential energy audits, upgrades and renewable projects. Our tool also generates a customized report identifying people and organizations that can provide these services (vendors).

We want your business to be a part of this important resource. Go to nhresidentialenergy.org and enter your business into our database. (Be sure to check out our Terms of Use and Instructions for some helpful hints on filling out the form.)

Thank you for your participation! For more information contact Madeline@nhsea.org.

Thanks to a generous \$10,000 grant awarded to NHSEA by the Otto Haas Foundation, NHSEA will continue to bring you the educational events and

workshops that you depend on us for. For more information on these events and others please see our on-line events calendar at www.nhsea.org/event-calendar/index.php.

UMass, Lowell: And the Work Goes On...

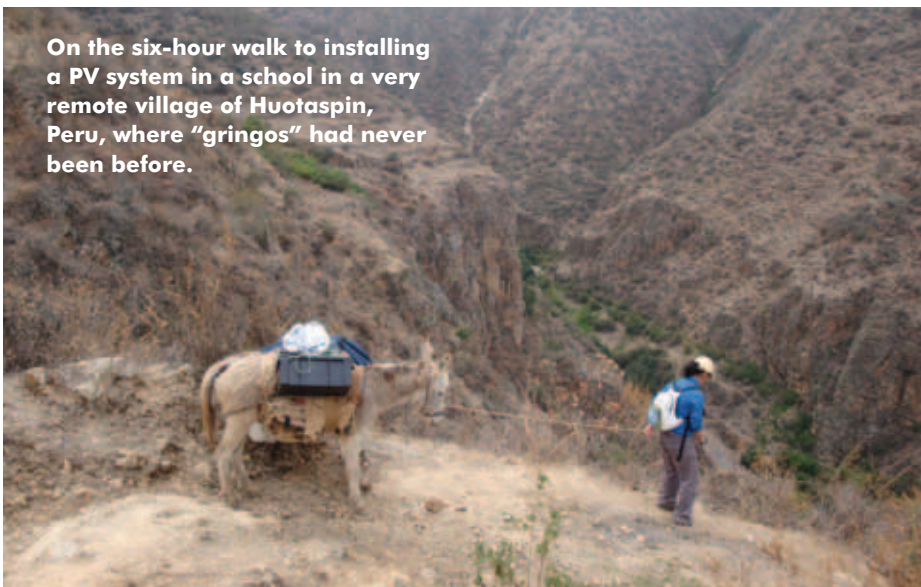
This was a busy fall and winter for us at the University of Massachusetts, Lowell NESEA Chapter. Besides our continuing Village Empowerment Project which provides renewable energy sources to villagers in Peru, we took on a new project, the DOE-sponsored Solar Decathlon.

For the Village Empowerment Project, several members designed renewable energy systems for the mountains of Peru. These included a windmill drip irrigation system and an adobe home with horizontal glazing over a central courtyard designed to maximize passive solar heat. Led by Professor John Duffy, a team of fifteen students and other volunteers traveled to Peru in January and installed (or, in the case of the house, helped local workers to build) these systems, demonstrating once again that renewable energy is a viable (and often the only) source of power for remote, impoverished areas. The sustainability

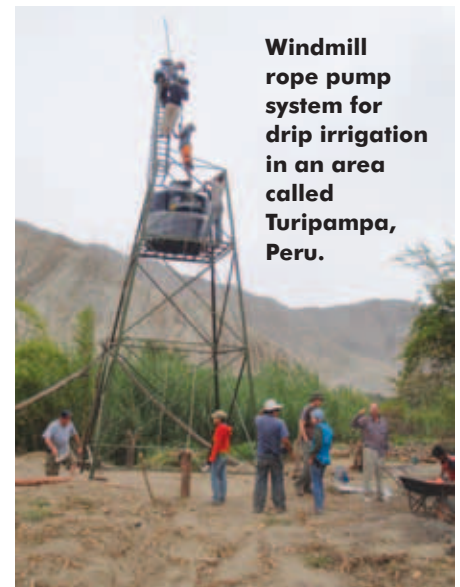
of this project is amazing—this was our 26th trip to Peru, spanning a 13-year period. The project has provided hundreds of engineering students the opportunity to work on real-world solar projects that have improved the lives of thousands of Peruvians.

In October, our chapter was approached by architecture students from the Massachusetts College of Art and Design in Boston to form a team for the 2011 Solar Decathlon. This is a bi-annual event for university students to design and build a small home powered only by the sun. If selected, our team will eventually compete in ten individual events on the Mall in Washington, DC in October 2011. It's a tremendous opportunity for us on many levels (collaboration with another college, working with the latest innovations in solar power, expanding our chapter to a wider group of students, and so on), so we eagerly agreed to form a team and began work immediately to prepare the proposal. Only twenty teams are selected for each competition, and for past years, nearly 100 proposals have been submitted. So far, we know we have made it to round two. We should know by April of this year if our team makes the final cut. Stay tuned! ■

On the six-hour walk to installing a PV system in a school in a very remote village of Huotaspin, Peru, where "gringos" had never been before.



Windmill rope pump system for drip irrigation in an area called Turipampa, Peru.



NESEA's Next Generation

JENNIFER MARRAPESE

One of the big topics of discussion around NESEA is how we can do a better job of cultivating the next generation of NESEA-ites. What are the 20- and 30-somethings looking for in a multi-disciplinary professional organization that addresses sustainable energy, energy efficiency, and whole systems thinking, and what can NESEA do to move in that direction? With the age of our average member being 45, we are ill-equipped to answer this question.

Rather than having the “old guard” continue to speculate, as interim Executive Director I thought it would be interesting to interview a few of the young NESEA “up-and-comers” to get the story firsthand.

I issued an open call to young NESEA members who wished to participate in these interviews, and 13 people responded. Not only was this a great opportunity to hear from them what they value about NESEA and how they want it to evolve, it was also a great chance to involve them in some new NESEA projects such as the Professional Leadership Awards Committee.

Although space constraints prevented me from including each full interview in this article, I have culled the common themes and included excerpts from those that were representative of the group.

NESEA: What things, specifically, should NESEA be doing to cultivate emerging leaders in sustainability and whole systems thinking?

Mark Couet: Connect more people, more often. I was very lucky to have found mentors through two past employers that both happen to be NESEA leaders. Last year I started a Google

group called “NESEA’s Next Generation Network.” I gathered 20 or so names and a few of us had an informal meeting with some of NESEA’s leaders after last year’s “Generations” session. I saw great potential in those face-to-face meetings as the next generation reached out to potential mentors. I do sense that NESEA is doing more than it has in the past to invite in the next generation.

It’s also very important for younger people to meet people of their own generation—peers with whom to collaborate and network. Sometimes it’s just nice to be with someone your own age. Jamie (Wolf) talks about how NESEA peers are his “tribe,” and while it’s great to be included, I’d like to establish my own tribe.

Marybeth Campbell: Maybe NESEA could create some sort of internship or co-op model, so that the conference could become a place where people find and hire interns or employees. Because the conference is such a social event, perhaps NESEA could have a youth portion to focus on the next generation and incorporate more “outside the box” and “radical” thinking. Someone would need to manage this so the thread could be continued throughout the year. Many of our NESEA veterans were once perceived as radicals when sustainability and energy efficiency were less understood or accepted, yet they have persevered because they have built their reputations on passion and exuberance that is supported by logic and experience. Our resident experts in the NESEA community talk the talk and walk the walk. However, I do perceive a divide among our veterans and the next generation. Perhaps there is a perception that the fight is still theirs to wage alone. But the reality is we need to do more to make that passion viral and branch the

family tree. The next generation will inherit the responsibility to carry that logic and experience forward and reinvigorate the passion too. Recognition from veterans that the next generation is an extension of our opportunity rather than an expiration of ideals is a step forward to breeding more success in our building practices.

Brian Hayden: Give us official positions and titles. It sounds a little silly, but if someone has a title they often feel a lot more invested. They are more likely to commit when they have a personal stake in the outcome. Give me an opportunity to help build on what NESEA does really well because NESEA is a community of people that I care about.

Caroline Petrovick: If I weren’t involved with NESEA through my firm’s office, I don’t know how aware I would be of NESEA. In my grad school program, I think the only people who attended the BE conference were Jesse and I—both from Coldham & Hartman. I think NESEA could do a better job of marketing to students and faculty of the New England schools. Social media, like Facebook, Twitter, and LinkedIn, present good opportunities for reaching out to younger potential members. I don’t mean to focus only on social media as a way to reach younger members, but I strongly believe it is the best, most efficient way to introduce NESEA to that generation.

Jesse Selman: As much as I love the BE conference, it doesn’t always deeply challenge the way we do things. It doesn’t necessarily address systemic change in the way the public forum does. NESEA is beginning to create more such opportunities that really involve whole systems thinking.

Incorporate social justice issues into the work we do, and understand the big



picture while building local resilience. It's one thing to talk about building a net-zero house in the suburbs outside of Boston, but much harder to ask, "how are we all going to stay warm and eat in a post oil economy?" NESEA provides a very appealing forum to have these conversations. How do we link these young people who think more radically with those who have the decades and decades of experience to make it happen?

Heidi Kowalski: It's tough getting a job right now. Any opportunities you can create for students to get a foot in the door, to get the training they need to get into green businesses would be great.

It would be really valuable to get information "straight from the horse's mouth" about exactly what training will be necessary to land a job in sustainability. It would be great if NESEA could list various green businesses in their Sustainable Green Pages even if they are not members to further promote sustainable businesses. Maybe they could provide premium listings to members.

Jason Forney: At this point for me it's continuing to be exposed to leading edge information. On top of that, creating opportunities for emerging leaders to be with established leaders. The model adopted for BE this year—of pairing

a younger track co-chair with a more experienced one—has been a good one. Giving younger people the chance to put their information "out there" for critique is good. People have been very welcoming every time I've gone to a NESEA conference or an event. They don't hide behind their laptops or their cell phones between sessions. People very consciously approach people they didn't know and try to get them involved.

Luke Falk: There seems to be a tension between the close-knit group that formed the organization a few decades ago and the new people who want to come in. NESEA values its superstars.



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My question is whether people feel like everybody else involved can carry the torch. How do you create the spirit of camaraderie and trust without the intimacy of the circumstances under which NESEA was initially created?

Something I've observed is that often times pioneers run the risk of having their influence marginalized when the ideas that they were out ahead of and have been trumpeting all of a sudden take hold in the greater market and the the pioneers remain married to notion of being pioneers and steadfast outsiders. Then the opportunity to have the wave of momentum that they helped create be as beneficial as it can be and as finely tuned en masse is abandoned by the pioneers themselves. Many people are advocating for the abandonment of LEED because the LEED Energy and Atmosphere section is based on modeled savings, which don't necessarily materialize during building operation.

Some of NESEA's most brilliant pioneers think we should destroy LEED because of this. But from my perspective, this isn't a situation where we should throw the baby out with the bathwater. LEED is the most powerful market transformation tool that green building advocates have ever had (except for maybe ENERGYSTAR®). But as with any tool (take a hammer, for example), there are geniuses who use it to create masterpieces and morons who use it to create crap. It doesn't mean the tool should be tossed off. I'm not arguing that there isn't certainly room for improvement in LEED; of course there is. To continue this silly analogy, if a hammer doesn't work half the time, it probably needs to be redesigned or fixed, but the task of nailing something into the wall will remain. And I think, if you already have a hammer, even if it's bent, maybe it's better to try and fix it rather than toss it off in favor of something else entirely.

Chris Sirois: You're doing it right now, ask them to get involved and give insight. People typically love to help.

Jess Lerner: It comes back to a foundational interest and effort to cultivate the deeper meaning of things. Rather than simply focusing on building, NESEA needs to expand to people who can see the big picture—the foundational concept and consciousness for “why are we doing this, how are people thinking and operating, what stage are we at in the movement, what are people motivated to do and why.” We should build up from the foundation of rootedness in the values of why we're doing this in the first place.

NESEA: How can we use mentoring to cultivate the next generation?

Marybeth Campbell: We definitely need to do more with mentoring—either by having younger NESEA members serve as co-track chairs for the conference or in other ways. Mentorship needs to be more than an episodic event. We should find a mechanism to develop ongoing relationships between younger members and NESEA veterans, and begin to transition responsibility so that some of these members can move on when it's time for them to do so.

Brian Hayden: One of the things I've done is to set up a peer mentoring group. It's a group of small business owners who meet to talk about the issues we're facing. One person gives a presentation every time, and we all learn from each other because we're all facing many of the same issues, and each of us brings a different professional perspective. If NESEA could help convene something like this and make sure that some of its more experienced members participate, that would be great!

Caroline Petrovick: I think there's an opportunity to get the universities more involved, initially by involving the professors and then engaging the students.

Jesse Selman: First of all, I love mentoring and have been very fortunate to learn from the expertise of the old NESEA guys. Sorry guys, you're old. At the NOFA Conference (Northeast

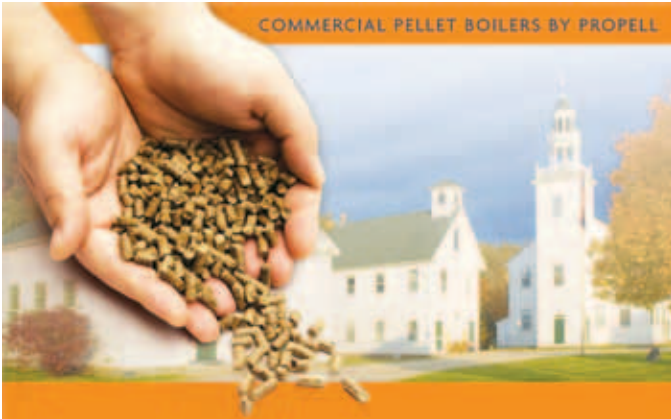
Organic Farmers' Association) there are always half a dozen tables at lunch with a designated conversation topic and a leader to lead the discussion. I'm a huge fan of face-to-face. Creating opportunities to sit down with the heroes—the Alex Wilsons and Marc Rosenbaums—is the most important mentoring opportunity to me. I also think encouraging people to take on projects in their own communities is a good way to foster mentoring relationships. NESEA has many experts who donate their time to do energy efficiency audits and retrofit work for schools and nonprofits. Maybe NESEA can help pair those folks up with interns to help build the necessary skills—sort of a localvore's approach to building capacity within each community!

Tyler Cande: Mentoring is huge for me! When I got out of school, I thought my dream job would be to be the assistant of someone who was truly excellent in their job and would 'take me under their wing,' so that I could learn from an expert. I'd be interested to find out more about who else is in the organization and how I can connect with them. I would also love to mentor others—maybe in a K-12 setting. It would be great to have NESEA develop some sort of buddy system, a valuable resource for talking shop.

Jason Forney: I've always felt that forced mentoring doesn't work. It has to happen naturally. So creating the opportunities for people to find each other is, in my opinion, better than saying “you're going to be his or her mentor.”

Luke Falk: There's always going to be a tension between an organization trying to promote mentoring and the fact that real mentoring is a personal experience that a professional has to decide to engage in. I've been beyond lucky to have Andy (Padian) play such an active role in my professional development but I'm not sure exactly how you can work to institute that across a broad group of people. But maybe NESEA can

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provide money to allow people to do this, through conference scholarships, facilitating free places to stay, having local people agree to cook a meal or something. These are all pieces of the puzzle.

Jess Lerner: I love the idea of the mentoring, and am thrilled to have a mentor in Robert Leaver. I would love to have a structure so that we might have a monthly meeting and talk about how to further the goals. NESEA could create a more formal mentoring system so that young professionals could be matched up with somebody they want to learn more about.

NESEA: What kinds of things are you looking for in terms of professional development opportunities?

Mark Couet: NESEA offers excellent information, experience, and knowledge at BuildingEnergy. It would be helpful to me if NESEA could better facilitate courses throughout the year, specifically certification opportunities like becoming a HERS rater or Passive House certified.

Marybeth Campbell: NESEA could also do a better job of marketing to its members the things we do that can help them find good employees. Universities would also benefit from NESEA advising them on the appropriate curriculum pipeline so they can create programs that will make students more employable in sustainable fields once they graduate.

Jesse Selman: Right now NESEA's offering everything I would expect or have time for from a single organization. NESEA fits nicely into a broader network of organizations dealing with social and environmental justice, hunger, climate change, etc. All of these issues are connected. You guys are doing a lot—sustainability workshops, the conference, Green Buildings Open House. The Conference is amazing. It has accelerated my learning in this field. Every time I go it pushes me forward at a rapid rate, and I get really excited about using what I've learned. I don't feel like I need more.

Jason Forney: More opportunities to replicate what I learn at BE on a smaller scale and more frequently.

Luke Falk: I like the idea of the traveling road shows that people have done in the past. Marc Rosenbaum did a few, Larry Harmon as well. There are a lot of people who could do topical stuff. However, if NESEA wants to be the clearinghouse for information and a professional connection hub, there may need to be more of an effort to move away from our impulse to highlight only the best and the brightest within the community. If NESEA is seeking to become the glue that unites the field, we need to be not only into the nuts and

bolts of building science, but also the nuts and bolts of the tools that professionals need to make their businesses work. For example, John Straube is doing a session at the conference this year about a computer program called THERM. That session is a perfect union of a brilliant guy teaching a tool that many stakeholders in the field could benefit from learning about. I think that kind of targeted training may be a key to the future of the organization.

Ryan Lacey: I always keep my feelers out to learn what architects, interior designers, and civil, electrical and structural engineers are doing because creating sustainable, energy efficient buildings

INTERVIEWEES

- **Mark Couet**, 30, remodels homes as a designer and a builder.
- **Marybeth Campbell**, 31, is the Workforce Program Director for the Massachusetts Clean Energy Center.
- **Brian Hayden**, 30, runs Heatspring Learning Institute, a clean energy education company focused on geothermal heating and cooling systems and solar PV systems for buildings.
- **Caroline Petrovick**, 28, is a project manager at Coldham and Hartman.
- **Jesse Selman**, 36, also works as a project manager at Coldham and Hartman, and is working on his Masters in Architecture at UMass.
- **Heidi Kowalski**, 30, is a Sustainable Design and Technology student at Unity College in Maine.
- **Chris Sirois**, 35, runs his own business as an electrical contractor and has been a NESEA member for the past four years.
- **Tyler Cande**, 22, is a recent graduate of Boston College. He works in the energy services department of TRC Inc. to implement the Multifamily Performance Program run by NYSERDA (the New York State Energy Research and Development Authority).
- **Jason Forney**, 37, is an architect with Bruner/Cott in Cambridge, MA, where he designs higher education and cultural facilities, many of which involve adaptive re-use of existing structures.
- **Luke Falk**, 30, is a project manager in NYSERDA's New York City office.
- **Ryan Lacey**, LEED AP, 24, works at Petersen Engineering in Portsmouth, New Hampshire.
- **John Innes**, 27, is an installer and electrician apprentice with GroSolar in the Boston area.
- **Jess Lerner** runs Green on the Inside, a green living and healthy home consultation business that she launched three years ago.

requires a holistic approach. The BE conference helps accelerate my learning by exposing me to what the state-of-the-art is for these other trades.

John Innes: Workshops. To stay NABCEP certified I have to take the test again in three years, or some type of update test. Maybe refresher/code update courses would be good to offer for people already NABCEP certified to keep up to date with the code and also meet other people who could help them. I'm also looking to get more involved with design, so autoCAD training would be good.

Jess Lerner: Sometimes NESEA also feels a bit like we're not willing to pay attention to things like health and the environment because there is no hard evidence. There is hard evidence, and I'd like to see us talk about it.

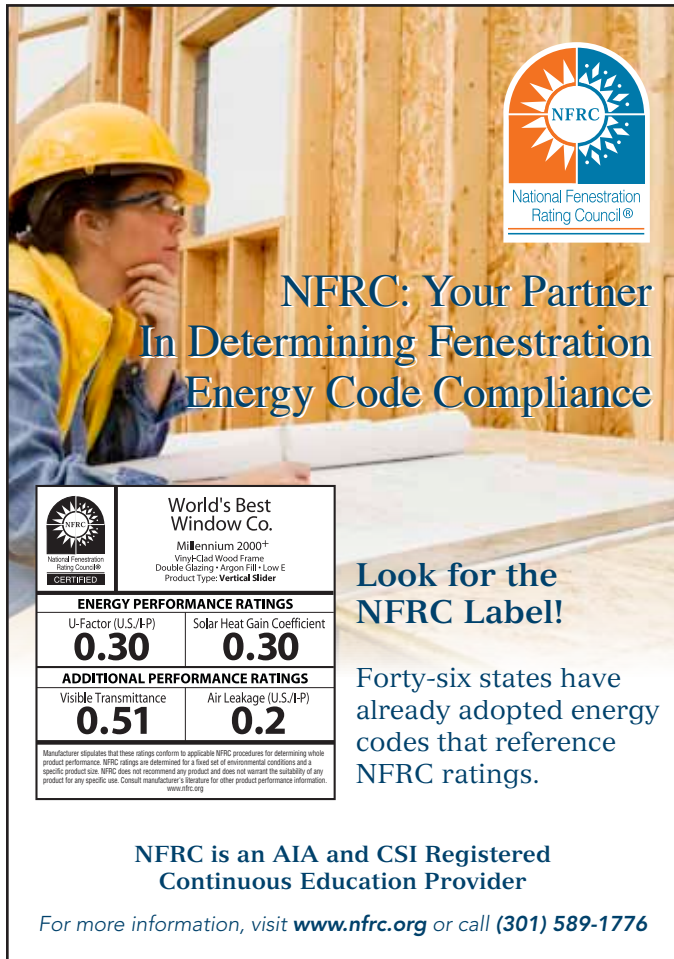
NESEA should be more diverse than

buildings alone. It would be good to see people talking more about impacts on multiple levels. I came into this field with a background in English and the arts. There's a connection between whole systems thinking, literature, place, and science. Yet there seems to be a really hard line where discussion is cut off. I wish there were more of a venue to explore that stuff—maybe through books at the book sale, a session or two to address things like sustainable economies and nontraditional practices.

It was a privilege to speak with these 13 young, rising NESEA stars and to learn how they would like to see NESEA evolve. It was clear that each of them really cares about NESEA and views it as a valuable resource in their respective careers. Our conversations


confirmed for me that there are many things that we are already doing well, like fostering discussion and debate among a diverse group of professionals from different fields, and insisting upon proven results and real case studies rather than relying upon modeling. These conversations also highlighted many areas for improvement. For example, there needs to be more opportunities for young people to get involved in a NESEA chapter. Also, many expressed interest in having NESEA serve as a resource for employment opportunities. We will be exploring these and other means of attracting and retaining younger members through our upcoming strategic realignment process—stay tuned! ■

Jennifer Marrapese is the Interim Executive Director of NESEA.



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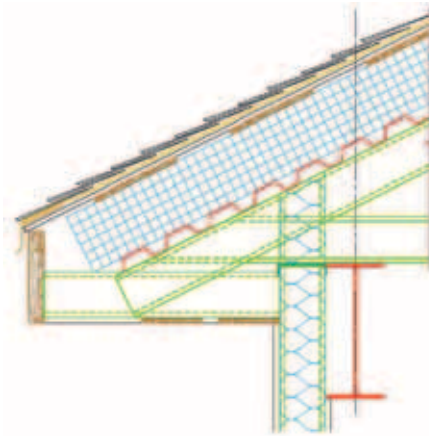
STRUCTURAL ENGINEER: FRIEND OR FOE?

JIM D'ALOISIO

Finding out why many buildings don't perform thermally as well as their energy model had predicted has been a topic of much debate lately. Modeling systems, building rating systems, and occupant operations have been identified as possible culprits. In addition, we must take a critical and humble look at the design and construction of the buildings themselves—especially to identify any significant flaws in our logic of building envelope design.

What has your structural engineer done for you lately? If your answer is something like: "A structural engineer doesn't have anything to do with a building's energy efficiency, so I keep their services and involvement limited, and focus on the things that you know matter to your building project"—read on. This article explores the ways in which an energy-conscious structural engineer can help a team if that person is integrated early enough and closely enough in the design process.

First are the decisions regarding the building systems. Somewhere at the beginning of a project's planning process, the project team usually decides on the building's basic elements: the overall size, the type of building, and the rough layout. Frequently, this leads to an expectation of the structural system, which then gets communicated to the structural engineer (who wants to know), and everyone gets his or her way in terms of design. This is the time to consider the possibilities of non-conventional construction—structural insulated panels or insulated concrete form superstructures, autoclaved aerated concrete, frost-protected shallow foundations, or even the



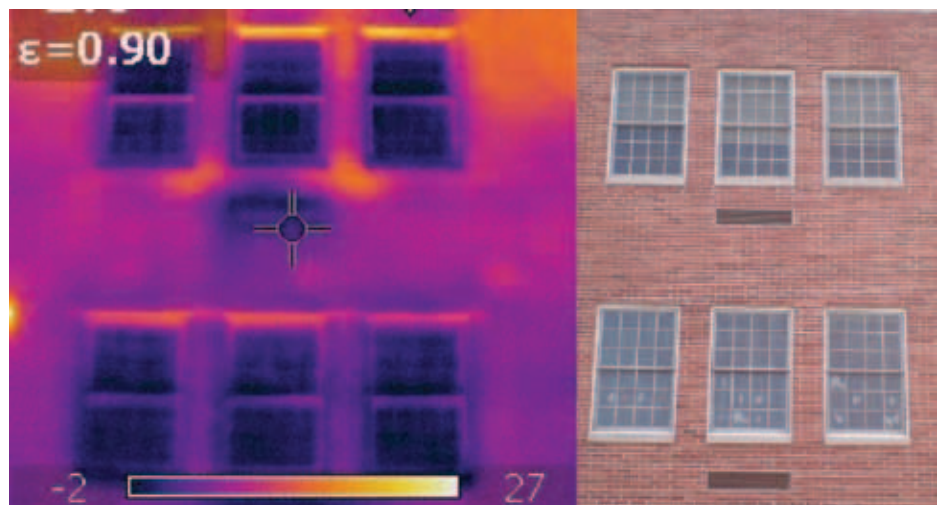
Schematic section of heat loss potential through cold-formed steel roof truss overhangs.

quintessential alternative system, straw bale. And for the project team to seriously consider these options and make a sound decision, the entire team—the project designers and the owner's stakeholders—needs to come together and brainstorm. Of course, if the idea that the project doesn't have any room in the schedule or budget for such a meeting carries the day—not on *this* project.

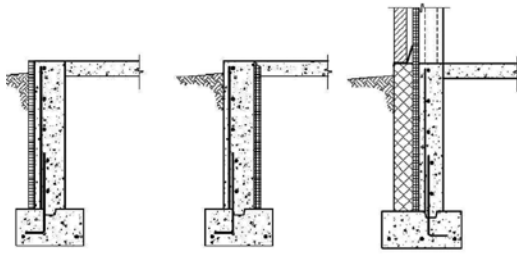
Also, the structural system of a building cannot be separated from the building envelope. In most cases they are one and the same, such as bearing walls or framed roofs. Even when the exterior skin of a building is nonbearing—such as brick in a cavity wall—the structural ties and supports for the skin can transfer heat energy right out of the building. This is also true of foundation details, especially the tricky condition where the slab on grade meets the exterior foundation wall. As such, if the structural engineer does not have at least a basic understanding of building science, the energy performance of the building may be compromised. Or, to be positive—a knowledgeable, sympathetic structural engineer can help make sure a building is as energy tight as possible.

Foundations

Let's start at the bottom. Whether the structural engineer, architect, contractor, or building envelope professional makes the call, insulation needs to be continuous along either the outside or the inside faces of the foundation walls—or in



Heat loss through steel lintels revealed in infrared image.



Foundation insulation on the outside face, inside face, and sandwiched inside.



Sandwiched foundation insulation in use in upstate New York school building addition.

the middle of the wall (above). The choice is partially dependent on what works with the superstructure, to minimize or avoid thermal bridging at the interface and slab edge. Each system has its pros and cons. Insulation outside the walls must be protected from the elements, but it avoids having to insulate the slab edge on the inside. Interior foundation wall insulation is quite common, but it necessitates having to figure out a detail at the floor elevation to break the thermal continuity between the thermally massive concrete slab and the exterior.

One common but ugly option for the slab edge insulation is creating a 45-degree chamfer at the top edge of the insulation, so that the top acute edge is even with the top of the slab at the face of the foundation wall. Four “points” about this detail:

1. It’s unattractive and few people like it. Many are afraid of it causing problems.
2. We have had it built in dozens of buildings with a variety of construction teams, and have never seen it create significant constructability or serviceability problems.
3. It is a compromise to minimize thermal bridging—not a perfect solution.
4. If this detail is not built and the slab is run right up to the face of the wall, or separated by only a nominal amount of insulation, the building’s energy performance will be compromised for its entire service life.

Because there is such “attitude” about this detail, we frequently resort to including it as a specific inspection requirement on the Statement of Special Inspections to make sure it gets built.

A system we have now used on several projects with cavity wall masonry construction involves extending the rigid insulation continuously down to the footing. The brick or exterior masonry can be supported on concrete masonry units below grade. This detail creates continuous insulation with no bridging as well as protection of the insulation against mechanical damage. The drawback is that the mason needs to be on-site earlier, although this can help with the coordination of a project anyway. A supplemental benefit to this detail is a reduction of concrete compared to a more conventional configuration. This reduces the amount of Portland cement used, which reduces the CO₂ footprint of the project by roughly one pound for every pound of Portland cement not used (above).

Before we move up the wall, let’s ensure that on every project with concrete or masonry foundation walls and either steel or wood stud framing we provide a sill sealer material continually under the wall sill. This closes the air gap that can create a lot of conductive heat loss. Whether this is covered by others besides the structural engineer or not, let’s all show it.

Thermal Steel Bridging—Defying Conductivity

For better or worse, many building energy codes in this country establish a minimum prescriptive insulation R-value requirement for building components including walls, roofs, and slab edges. Thermal steel bridging is frequently not mentioned, although it is indirectly addressed in cold-formed steel wall studs by requiring a minimum continuous R-value across the stud wall. While there is elegance in simplicity, it has led to a generation of building designers who understand the importance of well insulated buildings but typically do not know how to take into account the effect of thermal steel bridging in determining effective R-values.

Let’s start with a simple relation: carbon steel conducts heat about 1200 times better than expanded polystyrene (EPS). What this means is that the potential heat flow through a wall that consists of 99.9% EPS bridged by 0.1% carbon steel is greater through the steel than the entire rest of the wall. For this to occur, the steel would have to be extremely well connected; that is, it would have to have a very efficient delivery of the interior building heat to its inside surface and have an equally efficient heat dissipating system on the exterior to get the heat out of the building. But consider a steel-framed building with an insulated cavity wall that has continuous steel relieving angles supporting the exterior

brick wythe. The angle might be continuously conductively connected to the warm steel spandrel beam, and the brick sitting on the relieving angle provides a wide path for heat to flow into its thermal mass and out to the outside air. The use of infrared cameras show that such heat loss does, in fact, occur.

The accuracy of a simple calculation to determine the effective R-value for wall or roof insulation that is bridged by a highly conductive material such as steel (known as a parallel heat path) is limited, since the degree of the bridge's connectivity on the interior and the exterior is a significant limiting factor. The mathematical formula for parallel heat transfer thus represents the maximum reduction of the R-value that the bridging material can have on the insulation. The thermal mass of the system's elements, especially if masonry or concrete is part of the system, serves to reduce the effective R-value reduction—but again does not lend itself to a simple calculation. Given the above caveats, the worst-case effective R-value of insulation bridged by steel is given by the following equation:

$$R_{\text{EFF}} = \frac{A_{\text{TOTAL}}}{A_1/R_1 + A_2/R_2}$$

For example, suppose one-tenth of 1% of a wall with continuous R-3.7 per inch EPS insulation is bridged by carbon steel, which has a R-value of 0.0031 per inch.

$$R_{\text{EFF}} = 1 / [(0.999) / (3.7) + (0.001) / (0.0031)] = 1.7 / \text{inch}$$

This is a potential 54% reduction in the original EPS' insulating value.

Steel lintels supporting insulated masonry is another condition where continuous steel elements bridge the wall insulation. A continuous steel plate is a clean way to cut off the opening head and provide a smooth surface to attach the window, but the heat loss that it represents can exceed the heat loss through

the entire rest of the window assembly. Perhaps it is better to save the money on the windows and spend it on a detail that eliminates the thermal bridging!

We have successfully experimented with the use of fiberglass reinforced plastic (FRP) plates and angles as structural "shims" in hung lintels which break the thermal bridge. In 2009, we used such a detail in three small school additions with three different construction teams in upstate New York. As with any unusual condition, we worked with the contractors to minimize the chance of avoidable problems. What seemed to work best was encouraging the steel subcontractor to take on the tasks of fabricating the FRP elements and erecting the steel/FRP assemblies together. Although the material was fairly expensive, the details seemed to be constructable.

Another problem is that energy codes frequently are silent regarding wall-to-roof intersections. This condition, which is arguably neither a wall nor a roof, can be a place where a tremendous amount of energy is lost due to thermal steel bridging. In a steel-framed building, a continuous steel angle at the surface of the roof deck is frequently required as a collector as part of the structural roof diaphragm, and that angle is usually connected to a continuous steel angle supporting the roof edge blocking. When the framing is cold-formed steel trusses, any truss overhang needs to be carefully insulated to prevent steel bridging across the insulation.

Even the significant potential heat loss due to thermal steel bridging can be exceeded by convective heat loss, if there are gaps in the building envelope's air barrier. While air barrier continuity is almost never the responsibility of the structural engineer, some structural details can challenge the continuity of any air barrier system. A common attempt to address, or minimize, thermal steel bridging is to use intermittent clip angles to reduce the area of steel passing through the insulation plane. However,

such clip angles usually make it very difficult to install a continuous air barrier at these locations. This is another advantage of using continuous FRP elements, since the FRP can serve as a connective material for the air barrier.

What about brick ties? Although they usually represent a small area of steel passing through the insulation, the loss can be fairly significant, especially with the large-diameter ties that are being sold, ironically, to be used to extend across thick insulation. Since stainless steel conducts heat roughly one-third as well as carbon steel, designers should consider using stainless steel brick ties.

Other countries have addressed thermal steel bridging better than we have. In the UK, their building code prescriptively limits its effect. Much of the world has proprietary materials that can be used to block thermal bridging, such as the line of Schöck Isokorb products. The author was recently informed that this company is about to target the US market. We certainly have the need.

So what can a structural engineer do? Plenty! In the best case, he or she can help save energy from leaking out of a building's envelope. In the worst case, by focusing solely on structural strength, deflection, and the like— inadvertently sabotage a building's energy performance. Make sure the structural engineer you work with is working on your side. ■

Jim D'Aloisio, PE, SECB, LEED AP BD+C is a Principal with Klepper, Hahn & Hyatt Structural Engineers, Landscape Architects, and Building Scientists in East Syracuse, NY. He is active in the USGBC's NY Upstate Chapter, and is on the Structural Engineering Institute's Sustainability Committee, where he heads the Thermal Steel Bridging Working Group. He can be reached at jad@khhpc.com.

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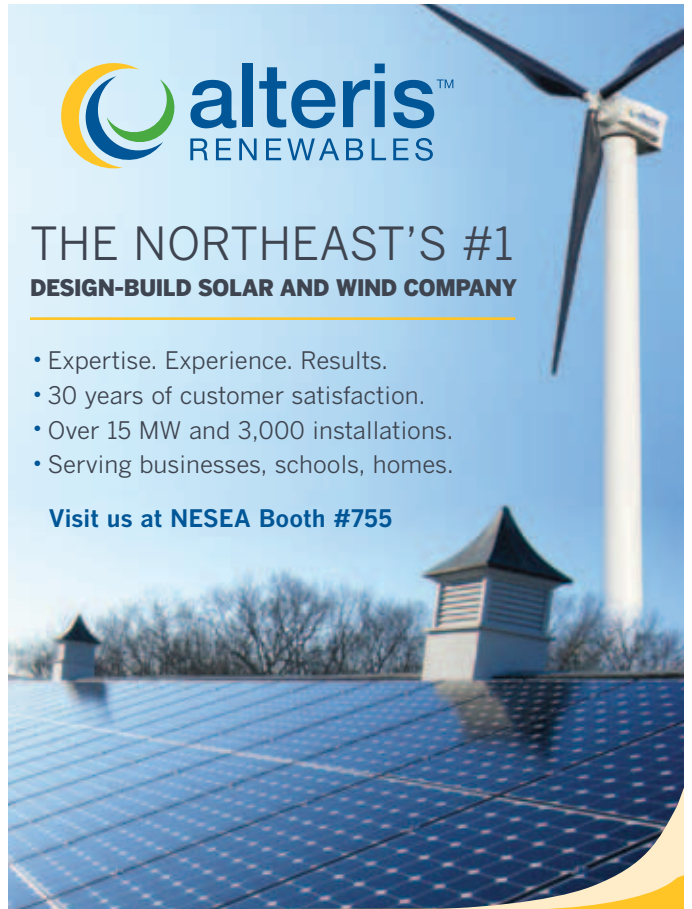
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CAPE AND ISLANDS ENERGY TECHNOLOGY STRATEGY

Priorities for Increasing Independence, Reducing Emissions, and Creating Jobs

CHRIS POWICKI

In practical terms, what is the meaning of ambitious energy-related targets such as an 80% reduction in greenhouse gas emissions, a 2.4% annual reduction in electricity demand, or 2,000 megawatts of installed wind capacity in Massachusetts? Clearly, they imply that citizens, businesses, nongovernmental organizations, and agencies and officials have a lot of work to do. But are they technically feasible, economically viable, environmentally sound, socially acceptable, and mutually reinforcing? And how can the national and global transitions from the energy present to a highly efficient energy future fueled by renewable resources and other low- and non-emitting supply options be managed to maximize benefits at the individual and local levels?

The *Cape & Islands Energy Technology Strategy* addresses questions like these for the region encompassing Cape Cod, Martha's Vineyard, and Nantucket. It was developed through the Cape & Islands Renewable Energy Collaborative (CIRenew), a NESEA chapter and nonprofit organization promoting a sustainable energy future. The strategy and its underlying development process

provide insights into how communities, businesses, regions, and states might pursue ambitious energy-related agendas.

Moving "Beyond Cape Wind"

Cape Cod, Martha's Vineyard, and Nantucket face similar challenges associated with their unique "energeography." Located at the terminus of supply and delivery networks, they suffer among the highest energy costs in the country and are particularly susceptible to market volatility. As eastward extensions of the state and nation, they are downwind from major sources of pollution and experience air and water quality problems. And formed by previous climatic variations, they are extremely vulnerable to the physical manifestations of global change.

Against this backdrop, outsiders might assume that the offshore wind project proposed for Nantucket Sound would be welcomed as a solution for increasing energy independence and reducing pollutant and greenhouse gas emissions. Instead, it has sparked contentious debate, fractured environmental and business alliances, and threatened progress within local communities.

To help depolarize, organize, and advance energy-related discussion, CIRenew participants facilitated a "Beyond Cape

Wind" stakeholder process. Project opponents and proponents—as well as those not taking a position—contribute to constructive dialogue on conservation, efficiency, and renewable energy opportunities. The name of the process is intended to be both provocative and ambiguous, as "beyond" may mean "instead of" or "in addition to" the proposed wind farm, depending on perspective. Having a galvanizing issue—in this case Cape Wind—helps bring diverse constituencies to the table.

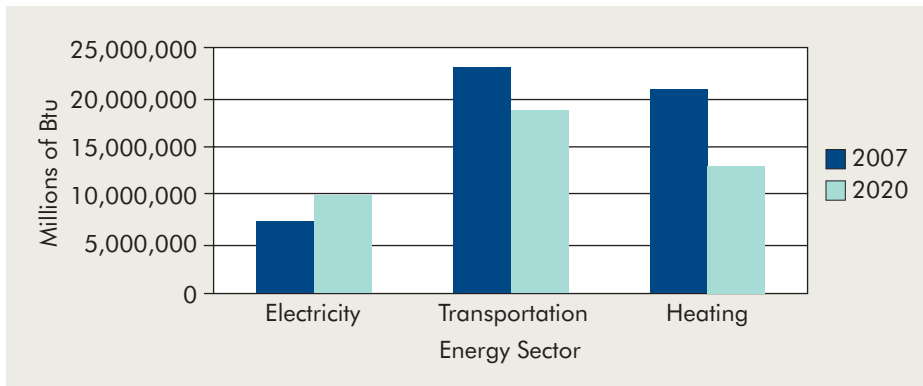
Through meetings, surveys, and other activities, Cape and Islands stakeholders have achieved consensus on the adverse impacts associated with near-complete reliance on fossil fuels and the opportunities accompanying an accelerated energy transition, and they have developed a common vision for localizing benefits from offshore wind projects. CIRenew participants also have defined ambitious regional goals for the year 2020:

- **50% Fossil Fuel Reduction**
Cut fossil fuel consumption in half in the heating and transport fuel sectors.
- **100% Green Power Production**
Harness renewable resources to meet overall demand for electricity on a net annual basis.



These “stretch goals” motivate collaborative efforts. The Cape and Islands energy strategy provides the basis for quantitative, technology-based action plans and identifies research, development, demonstration, and deployment (RDD&D) priorities.

FIGURE 1
Cape & Islands Energy Technology Strategy:
Final Consumption, 2007 & 2020



The region’s energy-intensive tourism economy contributes to its relatively high fossil fuel consumption and large carbon footprint. Achieving the 2020 goals will dramatically increase energy independence and reduce emissions, with offshore wind projects supplying green power to allow electrification in the transport and heating sectors.

Setting Baselines and Targets

Historical consumption and future projections represent the starting point for any effective action plan or technology strategy. Developing a comprehensive energy inventory is at present a complex and time-consuming task.

NStar and National Grid provided key electricity and natural gas data for the Cape and Islands, but many important heating and transportation parameters are not readily available or tracked on a systematic basis. As a result, regional usage of gasoline, diesel, aviation fuels, heating oil, and propane was estimated by various means for a baseline year of 2007. The difficulties—and the numerical gyrations—involved in making usage estimates highlight a critical knowledge and capability gap for strategic energy

planning: A centralized repository is required to collect and make available important data across all sectors and geographic scales.

In 2007, some 61.9 trillion British thermal units of total energy and 51.2 trillion Btu of final energy were consumed by the Cape and Islands, as shown in Figure 1. That’s equivalent in energy content to a train of 100-ton coal cars about

350 miles long stretching from Boston to Baltimore. On a per-capita basis, the region’s consumption exceeds that of the rest of Massachusetts because of its energy-intensive tourism economy, but is lower than the national average due to the lack of heavy industry. Not surprisingly, the region is overwhelmingly dependent on finite and expensive energy sources imported from elsewhere. About 91% of regional needs were met by fossil fuels in 2007, and the total energy bill surpassed \$1.3 billion. Regional energy-related CO₂ emissions were 3.9 million metric tons, exceeding the carbon footprint of many heavily populated countries.

The energy inventory allowed quantitative targets aligned with the 2020 goals to be calculated. For *50% Fossil Fuel*

Reduction, the 21.8 trillion Btu of fossil energy consumed for transport and the 20.2 trillion Btu for heating set baselines. For *100% Green Power Production*, 2020 electricity consumption is not capped and could in fact be lower or higher than the 2.2 terawatt-hours sold in 2007, depending on many factors.

Developing Scenarios

Strategic energy planning requires consideration of historical trends and future objectives, current conditions and existing infrastructure, consumer behavior and renewable resource availability, technical and social progress, policy and market contingencies, and deployment scenarios.

The assumption driving the Cape and Islands technology strategy is that federal decision-makers adopt a market-based climate policy covering all energy sectors consistent with “stabilization of atmospheric concentrations of greenhouse gases at a level that will prevent dangerous anthropogenic interference with the climate system.” A substantial and sustained price on CO₂ emissions will transform energy markets by increasing the cost of fossil fuels and allowing the marketplace to work its magic. However, a strong carbon price signal alone is insufficient to effect massive change in a short time frame.

Fixing existing building stock in the Cape and Islands is complicated by the tens of thousands of homes built for seasonal living or otherwise not up to current code. Expanding ratepayer-funded efficiency programs is a step in the right direction, but only a starting point toward the 50% target for heating fuels. By 2020, every building must deliver at least a 30% energy savings through envelope and heating plant retrofits and all heating oil must incorporate at least 20% sustainably sourced biodiesel. One representative scenario of the additional fuel-switching measures required includes ~25,000 solar thermal systems for domestic hot water and ~7,000 for space heat-

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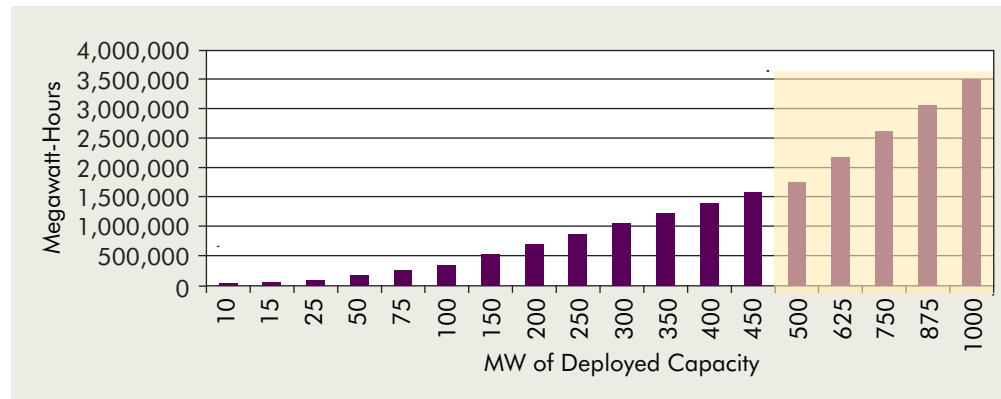


ing; ~5,000 wood and pellet stoves; and electrification, via ~7,000 air-source heat pump and ~1,500 geothermal installations, to displace fossil-fired technologies. Further, about 5,000 deep retrofit projects must be completed, and “net zero” must be the standard for new construction.

In the transport sector, almost every engine, motor, and system must be replaced to cut fossil fuel use in half. Gas-electric and plug-in hybrids, along with advanced internal combustion and diesel engines running on sustainable biofuels, must dominate the light-duty vehicle market in 2010. In addition, passenger rail must be re-introduced to provide access from urban centers, and high levels of efficiency and biofuel use must be achieved in trucking, marine, and air applications.

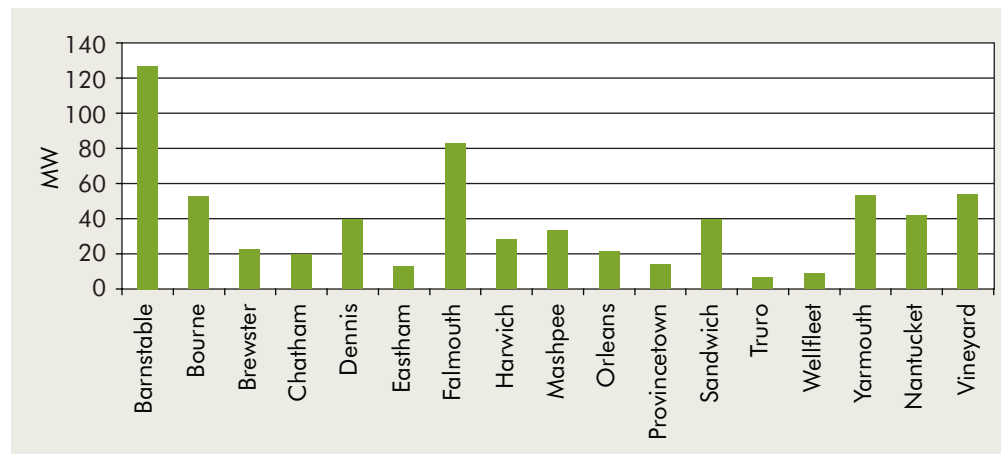
To support electricity independence, aggressive conservation, efficiency, and distributed generation scenarios must together yield a substantial reduction in demand imposed on the grid. These decreases are required to accommodate new loads associated with large-scale adoption of efficient electricity-based heating and plug-in hybrids, even though such electrification runs counter to the state’s goal of lowering overall demand by 2.4% annually. At the low end of future usage projections, about 500 MW of offshore wind capacity—slightly larger than the Cape Wind project—could serve the region’s needs in 2020, as shown in Figure 2. If sales expand significantly, a mix of community-based and industrial-scale projects with total capacity remaining under 1,000 MW appears sufficient (Figure 3). An additional 500 MW and associated power delivery infrastructure may need to be accommodated to meet the state’s wind energy target of 2,000 MW. Smart grid functionalities must be implemented at the transmission and distribution levels—and integrated with in end-use devices—to enable all of these advances.

FIGURE 2
Cape & Islands Energy Technology Strategy: Offshore Wind Generation for Regional Electricity Independence (CF = 40%)



Future demand for electricity could vary significantly from the present level, complicating efforts to project the amount of offshore wind capacity required for regional electricity independence on a net annual basis. Anywhere from 500 to 1000 MW could be needed, depending on conservation, efficiency, net-metered generation, electrification, and many other factors.

FIGURE 3
Cape & Islands Energy Technology Strategy: Offshore Wind Turbines for Local Electricity Independence (3.6-MW Units; CF= 38%)



Localizing benefits from future offshore wind projects is critical for building public acceptance. Most Cape Cod towns—and the entire islands of Nantucket and Martha’s Vineyard—could achieve electricity independence with 15 or fewer turbines, suggesting community-based project siting, planning and development as a promising approach for accelerating deployment.

Setting Priorities, Localizing Benefits

Strategic energy planning is guided by global, national, state, and regional objectives, but technologies are deployed and actions taken by individuals and groups driven by different motivations. Environmental, economic, and social considerations are factored into individual decisions in a way that may, in

aggregate form, be stated as follows: *If I take action, how will I benefit, at what cost, and with what adverse impacts?*

The Cape and Islands technology strategy identifies the RDD&D priorities required to dramatically transform the region’s energy economy in ways that localize and individualize benefits.

Market transformation, rather than

technological innovation, will pace progress in fixing existing buildings to achieve a 50% Fossil Fuel Reduction while reducing heating bills. New business models, social marketing techniques, and successful demonstrations of deep retrofit, electrification, biofuel, and other technologies represent near-term priorities to motivate immediate action and inform decision-making across the next decade. In addition, utility-administered efficiency programs must be restructured to encourage entrepreneurial activity, to expand participation by partnering with community-based cooperatives, and to keep jobs local by supporting comprehensive training and qualification programs. This will make it easier for consumers to implement major upgrades, thereby reducing capital outflows and decreasing the economy's susceptibility to market volatility.

Global developments in energy conversion and biofuel technologies will determine whether fossil fuel consumption can be cut by 50% in the transport sector. RDD&D projects will accelerate local progress. Plug-in hybrid charging stations powered by on-site photovoltaics to serve rental fleets at ferry and airport terminals will encourage car-free travel, demonstrate transport electrification, and provide grid support. Biodiesel usage in ferries, filling stations for flex-fuel vehicles, passenger rail and congestion fees for on-Cape travelers, and marine algae for local biofuel production represent additional priorities for attracting investment, inducing additional economic activity, and facilitating near-term action while informing future decisions.

Becoming an exporter of green power across the next decade requires demand-side activity, but most important, it implies that the Cape and Islands agree to host huge amounts of offshore wind generation. Implementing community-based project planning, siting, permitting, and development processes is the most critical RDD&D priority for

100% Green Power Production. In parallel, feed-in tariffs and other tailored incentives must be explored to bridge cost gaps between land-based generation options, shallow-water turbines, and future deepwater technologies. This will help mitigate rate increases while socializing the higher costs and environmental benefits of offshore wind across ratepayers throughout the state.

Whether the CIRenew goals are achieved in 2020 or later, the *Cape & Islands Energy Technology Strategy* outlines pathways toward a future in which the region gets more than 70% of its energy from local sources, reduces its carbon footprint by more than 60%, and lowers its overall energy bill even as commodity prices increase. From a broader perspective, Cape Cod, Martha's Vineyard and Nantucket have an incredible opportunity to address national, global, and intergenerational challenges while localizing benefits. ■

Chris Powicki is principal of Water Energy & Ecology Information Services, a consultancy based in Brewster, Massachusetts (chrisp@weeinfo.com). He also serves as CIRenew president and as adjunct faculty in the clean energy program at Cape Cod Community College.

Acknowledgments

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Sustainable Waste Management on Residential Construction Sites



JAY WALTER

Through my architectural practice, I have seen that residential builders treat construction waste in much the same way over the last 30 years. Everything goes into a 30 yard dumpster. Even with the “greening” of the industry, the focus has been on alternative energy systems and sustainable materials, with waste management an afterthought. Construction materials account for a full 30% of the total waste produced in the United States annually. Inevitably, municipalities will begin to regulate waste hauling from construction.

As resources for disposal are constricting, resources for diverting construction materials have dramatically increased in recent years. The problem with this explosion of new resources is the need for builders, architects and owners to sift through the options to decipher what will work. A local organization, The Sustainable Waste Management Collaborative, was created to help provide residential projects in the greater Boston Metro area with a directory of the resources for sustainable construction waste management. Here (right) are some tips from SWMC on handling construction waste.

Rethinking waste management can save you money and the environment. It also reflects a change in attitude. We need to move away from producing piles of rubble and return to finding value in the materials left from construction and demolition.

Jay Walter is an architect with a residential practice, Entasis Architects PC, in Newton, MA. In 2008, Jay founded the Sustainable Waste Management Collaborative to help builders, architects and homeowners reduce the waste stream from residential construction. For more info: www.thewasteman.com.

PERSPECTIVE AND PLANNING

- Create a new mindset on the job site in which materials aren't considered waste until no alternative to disposal can be found. Scrutinize everything you throw into a dumpster for recycling, salvage or re-use alternatives. The NAHB (National Assoc. of Home Builders) notes that fully 78% of construction waste, by volume, is recyclable, so there is lots of potential.
- Plan early to anticipate the time, equipment, storage and the cost of alternative handling. In remodeling projects, walk through the site to note the materials that can be salvaged or reused and integrate the handling into the project work flow. How many projects had a wonderful old floor or fixture that everyone agreed should be salvaged but was demolished instead, because when the time, came it was the most expedient thing to do? A little planning goes a long way toward keeping things out of the dumpster.

HANDLING

- Recycling no longer means lining up dumpsters to separate materials. There are haulers who recycle construction materials from co-mingled containers. This means you can fill a dumpster as you always have and the hauler will separate the materials at his processing center. This option is competitive with typical disposal costs and the easiest, but not necessarily the cheapest, way to recycle. (A great way to reduce disposal costs is to haul separated recyclable materials yourself. This eliminates hauling charges and the tipping fees).
- Save time and labor by minimizing handling. Don't move piles around the site! Use small portable containers on wheels to move and store materials or to move materials to and from trash chutes. Store recyclable materials like scrap metals in a bin until there is enough to haul.

HOMEOWNERS ROLE

- Bring homeowners into the planning and execution of the waste plan. Let homeowners recycle “household” refuse, like debris from lunches and snacks. It is silly to throw that stuff in your dumpster.
- Use municipal recycling services where appropriate for appliances, furniture, carpet, etc. Ask the homeowner to check with the local resource center to see what materials they will take. Some towns will even haul from the curb.
- Homeowners should utilize store and manufacturer take-back programs when they purchase new appliances.
- Offer homeowners and neighbors scrap materials for their use for home projects or fire-wood. This can reduce the volume of materials that go into the dumpster and provide good public relations for the project.

REUSE OPTIONS

- Consider alternatives to discarding materials such as doors, windows, cabinets, plumbing or light fixtures. Local MRCs (material resource centers) take contributions of building materials like cabinets, countertops, doors, windows, mantels, etc. Online exchange sites such as Craig's List are available to sell fixtures, architectural elements, or light fixtures. See www.thewasteman.com for more information on online exchange networks.

SOURCE REDUCTION

- Reduce the amount of materials brought to the site and you will also reduce your waste. Advanced framing techniques reduce waste by reducing the framing materials needed to frame wood corners, wall intersections, etc. Reduce waste further by utilizing shop and prefabricated assemblies and finishes. Factories are much more efficient in using waste materials than the local job site.

PURCHASING PRACTICES

- Good waste management begins with the purchasing. Choose products that minimize packaging. Packaging is the single largest source of waste materials in this country. Buy in bulk, but not products that just wrap single packages into bigger bundles.
- Purchase products with high-recycled content. Increase the market!
- Avoid products with chemical solvents or adhesives that are hazardous and difficult to dispose.
- Negotiate take-back agreements with suppliers for unused materials. Good clients can push suppliers to take back even small quantities of goods.

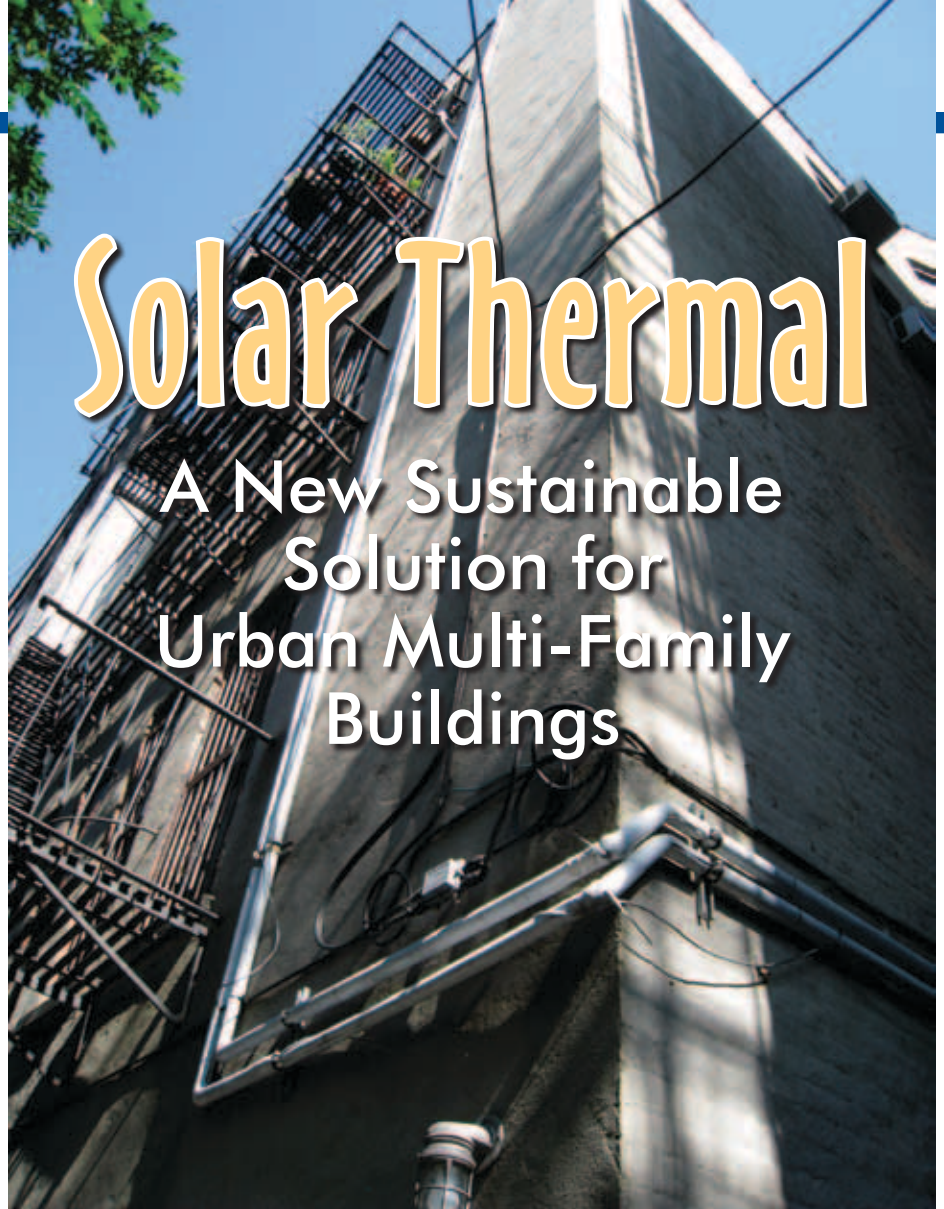
**RICHARD KLEIN AND
MARIELA VASQUEZ**

Installing large-scale solar energy systems is not easy in a city like New York where over 65% of the residential buildings are between five and 15 stories high. These installations on such tall city buildings can get very complex and expensive. This article draws on Quixotic Systems, Inc.'s (QSI) recent experience installing a solar hot water and solar electric system in a Brooklyn, New York multi-family cooperative, and discusses aspects of the design and performance.

Advantages of solar thermal over solar electric (PV)

Over the past few years, solar electric (PV) systems have gained greater momentum over solar thermal systems due to government incentives and more attention from the media. However, due to the diversity of buildings and their demands, PV systems are not always the most efficient or financially beneficial renewable energy source. Solar thermal systems are capable of providing better efficiency and return in larger residential buildings where the domestic hot water load is greater than the electricity consumption (see Table 1).

Over 65% of New York City buildings are five to 15 stories high and many of them are multi-family co-ops or condominiums. In such large residential buildings, the common domestic hot water load for cooking, showers, and laundry is considerably higher than electricity usage for the common meter of the building (hallway lighting, elevators, etc). For example, in QSI's installation in the multi-family cooperative in Brooklyn (described in detail in this article), the monthly bill for the common electric meter was about \$100, whereas the gas bill for domestic hot water was approximately \$600. In cases like these,



Solar Thermal

A New Sustainable Solution for Urban Multi-Family Buildings

TABLE 1
Energy profile of a 12-unit multi-family building in Brooklyn

Summer Months	kWh (for common electric meter)	kWh (for domestic hot water)*
May	274	8910
June	322	2799
July	262	2799
August	212	3371

** Domestic hot water usage is reported in therms. For clarity in comparison, therms were converted to kWh (1 kWh = 3412 Btu, 1 therm = 100,000 Btu). Table by Quixotic Systems, Inc.*

the installation of a solar thermal system will bring more annual savings than a solar PV system.

In addition, solar thermal collectors have advantages over PV panels. A main concern when installing any solar energy system is shading. Many properties have southern obstructions from buildings, trees, or chimneys. Solar thermal collec-

tors are less sensitive to shading from neighboring objects than solar electric panels. For this reason, solar thermal collectors have a higher efficiency (60%-70%) than PV panels (15%-20%).

Installing a solar thermal system has also proven to be faster than that of a PV system. The "interface" of the solar thermal system with the building's exist-

ing fossil fuel system (the “grid”) is completely independent of the utility company, any state agency, UL inspection, and any other chimera that can haunt the sleep of a PV installer at night. When QSI installed the solar thermal system in Brooklyn, the waiting time for delivery of materials and approval of permits was about three months. In contrast, the waiting time for approvals from utility companies and financial incentives for the PV system took about one year.

Sterling Place Project

176 Sterling Place is located in Park Slope, an affluent neighborhood in Brooklyn. Well-maintained residential buildings and proximity to vast green spaces (such as Prospect Park) characterize this unique neighborhood. The residents of 176 Sterling Place (a self-maintained cooperative residential building) are strong advocates for preserving the environment and the promotion of renewable energy technologies. Quixotic Systems was contacted to analyze the possibility of installing a solar energy system to reduce the building’s large monthly bills (approximately \$100 per month for common electricity and \$600 per month for domestic hot water only). After an initial survey of the property, it was concluded that this five-story Brooklyn building built in 1906 was an ideal candidate for a solar hot water system as well as a solar electric system. The roof was spacious, there were minimal shading issues, and the domestic hot water demand was about 1,000 gallons per day (6.5 Therms/day).

The solar thermal system consisted of six sets of 16 evacuated tubes per set. The advantages of employing vacuum tube technology on a building like this were twofold: 1) The tubes, individually, are light and can be carefully carried to the roof in clusters, thereby savings thousands of dollars in permits for cranes or complicated types of rigging. 2) Sunda Seido-2 evacuated tubes (70% efficiency) allow for a flat installation. At this angle

the wind uplift is minimized and the air can go through the gaps between the tubes. The collectors were mounted on small structural beams, which were also able to be carried up. An existing load bearing wall functioned as one “anchor” of support for the system.

Running pipes from a roof to a basement can be arduous and expensive. The

design engineer of the project, Bhagavathi Natarajan (the only NABCEP certified installer in New York City), was able to minimize costs on the piping by taking advantage of the building’s structure. The piping was run on the back of the building right next to the fire escape. This avoided the need for scaffolding, normally expensive and time consuming.



Solar Thermal System on roof of 176 Sterling Place. Notice load bearing wall on the right hand side of the system.



One of the first “hybrid” systems in Brooklyn, New York.

Quixotic Systems, Inc.

Quixotic Systems, Inc.

In addition to the solar collectors, a solar storage tank, expansion tank, pumps, and a monitoring station needed to be installed in the basement next to the boiler and hot water heater. Even though there was sufficient space for the equipment, the access door was small (6' high and 32" wide), making it difficult to fit a 300-gallon storage tank through it. It is common for boiler rooms in NYC to have a difficult access, which must be considered before a solar hot water installation takes place. To solve this problem, Mr. Natarajan decided to use three 120-gallon tanks with removable insulation jackets instead, which could be easily fitted through the door.

The whole installation was completed in two weeks. The system provides about 60% of the annual hot water usage and the payback period is approximately five to six years (considering federal and state incentives). The monitoring station

controls the operation of the pumps in addition to storing data throughout the system every five minutes. This allows for keeping track of the system's performance as well as reporting the need for troubleshooting. The residents of 176 Sterling Place have noticed the reduction in their monthly gas bills and savings of approximately 100 therms per month (about \$200 monthly savings).

The building also purchased a 3 kW PV system installed by Tri-State Solar and designed by Quixotic Systems, Inc. Thanks to the flat installation of the solar hot water system there was no projected shading on the PV system. The installation of the solar electric system has made them one of the first buildings in Brooklyn, NY to have a "hybrid" solar system where both electricity and heat are produced. The 12 families that reside in 176 Sterling Place pride

themselves in their efforts to reduce their carbon emissions.

Key considerations for feasibility:

A solar thermal system has important requirements that must be met in order to function optimally and provide a good return of investment. These are the most important factors that must be considered before installing a solar thermal system:

Building height and boiler room location: If a building is very tall and the boiler room is located in the basement, the pipe run will be very long (costs for copper pipe range from \$3-\$7 per linear foot depending on size). This entails higher costs on materials and labor and a poorer return on investment. The ideal building height for a solar thermal system should be between two to seven stories high.

Size of boiler room or basement: A commercial solar thermal system re-

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quires large equipment such as a solar tanks, pumps, and heat exchangers. This equipment needs to be installed close to the boiler room or hot water heater, which in most cases is located in the basement. There must be sufficient space in areas close to the boiler or hot water heater to accommodate all of the components of a solar thermal system. There are multiple solutions for this problem such as using multiple small tanks as opposed to one big one or using adjacent rooms to the boiler room.

Usable roof area: A roof that contains multiple obstacles (HVAC units, skylights, bulkheads, etc) will limit the potential size of the solar thermal system. Smaller systems may not serve the needs of the domestic hot water usage for a particular building. In this case, more creative designs can be implemented such as placing collectors on top of bulkheads or other structures on the roof.

Steam—hydronic heating systems, domestic hot water: A bigger part of the overall fuel costs for buildings are from heating demands as opposed to the hot water needs. Unfortunately, in NYC many buildings use old (and antiquated) low-pressure steam systems that are hard to integrate with the solar component. In Europe and other parts of the country, one sees more hydronic heating systems that are ideal for a solar interface. Building developers in NYC will need to consider incorporating the solar heating hot water system in the design of new buildings, much the way that Building Integrated Photovoltaics is currently done.

Building age: New York City's residential areas are characterized by antique brownstone rowhouses built in the early 20th Century. Because of their old age, these buildings may lack the structural support required for mounting solar collectors on the roof. Before any installation, a structural engineer should inspect the conditions of the building to determine the feasibility of a solar system and recommend solutions for an installation to take place.

Shading: It is important for a roof to have a minimum amount of shading. Tall buildings, trees, bulkheads, and chimneys located on the southern part of the roof can cast shadows that will reduce the efficiency of a solar thermal system. In this case, higher efficiency collectors (such as vacuum tubes that have nearly 70% efficiency) can be used to deliver the required energy. Although more expensive, vacuum tubes are more efficient even when shaded since they can take advantage of direct and diffused radiation from the sun.

Initial investment: Although multiple economic incentives from the state and federal governments mitigate overall costs, a high-quality solar thermal system requires a substantial initial investment. The design, engineering and installation have to be extremely precise in order to function properly. Additionally, permits and other soft costs can amount to a substantial initial investment. In the future, these soft costs will need to be reduced if NYC is to see more development in the renewable energy sector.

Recent Solar Thermal Activity

Even though the installation of a solar thermal system has many hurdles as described above, the environmental and financial benefits are unparalleled. With the US natural gas prices increasing at an average annual rate of 10% over the last decade, the demand for solar thermal systems has been increasing. The annual shipments of solar thermal collectors totaled nearly 17 million square feet of collector area in 2008.

Due to this increasing demand, solar thermal systems have captured the attention of numerous entities. In 2009, the New York City Economic Development Corporation developed a Solar Thermal Pilot Program which provided funding of up to \$50,000 per project to select NYC businesses and institutions interested in installing a solar thermal system in their building. Depending on the success of this pilot program, further finan-

cial support from the state and federal governments could be requested. Also, in 2009, a Solar Thermal Consortium was held in Kingston, NY to develop a roadmap for the promotion and implementation of more solar thermal systems in New York State. These are only some of the recent developments of solar thermal systems, and we expect more to come in 2010.

Conclusion

With the rapid development of technology, our designed solar thermal systems are capable of providing approximately 50% of a building's annual hot water usage (a good parameter for measuring a well designed system in the Northeast). There are approximately one million building structures within the NYC area. If we were to assume that just 10% of this overall pool was adequate for solar installations, the amount of energy savings is large enough to have a substantial impact on NYC's total fossil fuel consumption. A large residential building uses an average of 200 million Btu of natural gas per month for hot water only (number based on 176 Sterling Place consumption). Using this average consumption in 100,000 residential buildings in New York, one can begin to see that 50% savings on this load is a very respectable number indeed! Solar thermal systems can certainly play a significant part in reducing the city's dependence on fossil fuels. We are committed to making this vision a reality. ■

Richard Klein founded Quixotic Systems Inc. in 1999 as one of the first solar thermal installer companies in NYC. He is a successful investor, entrepreneur, and inventor as well.

Mariela Vasquez was born and raised in Lima, Peru. She has a bachelor's degree in Mechanical Engineering from the University of Virginia and now works with the engineering team at Quixotic Systems.

BuildingGreen Announces

ALEX WILSON

Each year for the past eight years, BuildingGreen, LLC, publisher of the *GreenSpec Directory*, *Environmental Building News (EBN)*, and the new *LEEDuser.com* Web resource on LEED certification, has recognized what we consider to be the most exciting green building products of the year. Our Top-10 Products for 2009 were announced during the U.S. Green Building Council's Greenbuild Conference and Expo, held in November 2009 in Phoenix. These products are selected from among the several hundred listings added to our *GreenSpec* directory over the preceding year. *GreenSpec* products are selected based on criteria developed over the past 18 years by the editors of *EBN*. Manufacturers do not pay to be listed in *GreenSpec*, and no BuildingGreen publications carry advertising. **For more information, visit www.BuildingGreen.com.**



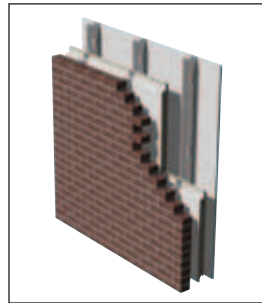
Pozzotive Plus concrete masonry units (CMUs) and concrete brick from Kingston Block are manufactured using up to 30% post-consumer recycled glass as a Portland cement substitute and an average of 50% post-consumer recycled masonry aggregate from local sources in the

Northeast. The recycled glass pozzolan (with the trade name Pozzotive) is ground to about 15 microns and used in place of the cement, saving about one ton of CO₂ for every ton of cement replaced. **For more information, see www.kingstonblock.com.**



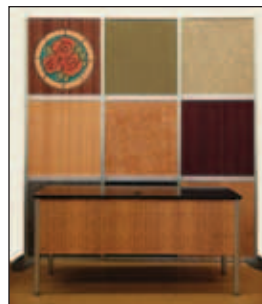
Thermafiber mineral wool insulation products are derived from 90% pre-consumer recycled iron-ore slag for commercial and residential thermal, sound attenuation, and fire-resistant construction applications. Thermafiber products, according to the manufacturer, are noncombustible without

flame retardants, are odor-free, will not absorb moisture or support mildew or fungus, and will not rot or decay. **For more information, see www.thermafiber.com.**



Invelope integrated wall insulation and rainscreen system creates a weather-tight backup wall system for metal-framed commercial buildings. Invelope provides a moisture and vapor barrier, drainage plane, and insulation—as well as a mounting system for brick veneer or terra cotta cladding—all in one panel system. Made from

corrosion-resistant steel wrapped around a polyisocyanurate foam core, Invelope comes in 32"-wide interlocking panels and is available in 12' and 20' lengths and in 2" (R-14) and 3" (R-21) thicknesses. **For more information, see www.buildbetterwalls.com.**



Baltix recycled- and bio-based-content office furniture

is made with a wide range of green materials, including waste-agricultural-fiber particleboard; FSC-certified wood veneers, MDF and bamboo; and recycled plastics, metals, and paper. The company's stock and custom workstations, tables, seating, and accessories

(including bookshelves, files, cabinets, and partitions) are available with low-emitting, UV-cured clear coatings or surfacings made from natural linoleum or a new biobased laminate, Biosurf. The company also has an end-of-life recycling program. **For more information, see www.baltix.com.**



Project FROG modular green classrooms feature high-performance envelopes, natural daylighting, high-efficiency mechanical systems, healthy materials, and green components. The basic configuration is about 1,200 square feet (110 m²) but the sections can be joined together into structures larger than 5,000 square feet (460 m²).

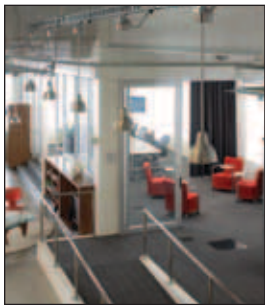
Designed as a green alternative to conventional portable classrooms and usable as well for other commercial space, Project FROG units come in a wide range of price points, from relatively affordable trailer alternatives to state-of-the-art, net-zero-energy, LEED Platinum classrooms. Project FROG's modular buildings can be assembled quickly with almost no construction waste yet are sturdy enough for Zone 4 seismic areas, and can withstand 110 mph winds. **For more information, see www.projectfrog.com.**

2009 Top 10 Products



The Rheem HP-50 heat-pump water heater has an integral 50-gallon tank and is Energy Star-listed. Intended primarily for residential use, the HP-50 operates in three modes: Energy Saver mode uses the heat pump only (energy factor 2.0); Normal mode, for higher hot-water demand, uses the heat pump and one of two electric-

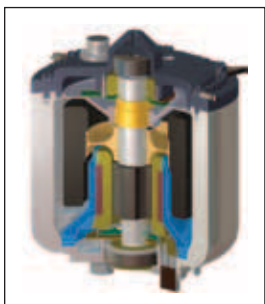
resistance elements (energy factor 1.5); and Electric Heat Only mode relies solely on the electric elements, functioning like a conventional water heater for particularly high demand. Among heat-pump water heaters on the market, the HP-50 has the longest warranty and is the quietest. **For more information, see www.rheem.com.**



Convia energy-management infrastructure, product of a partnership between Convia (a Herman Miller company) and wiring raceway leader Wiremold, is a modular energy-management platform that integrates lighting, switches, occupancy sensors, timers, and other devices and links them to sophisticated controls and dashboards

capable of monitoring and adjusting a building's over-all energy performance. Convia's infrastructure uses plug-and-play components that can be linked together to form larger zones, or pre-set to specific levels as needed. A radio-frequency "wand" allows individualized control from a workstation.

For more information, see www.convia.com.



Pentadyne GTX flywheel energy storage is a short-duration energy storage product used to replace batteries in uninterruptible power supply (UPS) systems for data centers, healthcare, manufacturing, and other commercial applications. Pentadyne utilizes a graphite-composite flywheel magnetically levitated in an argon-

filled, vacuum-sealed unit to store kinetic energy for use when the normal power supply is disrupted and before a backup generator starts or power is restored. Not only do these units obviate the need for lead-acid batteries (with a wide range of life-cycle problems), but they can operate over a much wider set of climate conditions, so can reduce HVAC energy use.

For more information, see www.pentadyne.com.



Silva Cell subsurface tree protection and stormwater infiltration system is a modular system that holds soil for tree growth and stormwater management while supporting paved surfaces. The system creates a void space that holds ten cubic feet of soil per unit, protecting tree roots from com-

paction and providing room for stormwater infiltration and surrounding utilities. Silva Cell meets the American Association of State Highway and Transportation H-20 standards for highway loading, so the system can be used under most paved surfaces, from parking lots to plazas and streetscapes. **For more information, see www.deeproof.com.**



Mobile solar power generators integrate photovoltaic (PV) panels, inverters, charge controllers, and lead-acid storage batteries into self-contained trailers that keep all components other than the PV modules fully protected and out of the elements. Used as a silent, more environmentally

responsible replacement for portable diesel or gasoline generators, these units are available in multiple models with maximum energy storage ranging from 9.3 to 45 kWh (390 to 1880 amp-hours) and daily power production up to 18.7 kWh, with rated output of 9.5–90 amps. Inputs are provided for AC power and conventional generators. When a backup generator is needed (in the case of extended low-sun periods or higher-than-planned energy draw), the system can be operated at full power with maximum efficiency to recharge batteries, then shut off, rather than being operated throughout the day.

See www.mobilesolarpower.net.

Alex Wilson is founder of BuildingGreen and executive editor of Environmental Building News and GreenSpec. He served as Executive Director of NESEA from 1980 to 1985. For more information on the 2009 BuildingGreen Top-10 Products visit www.BuildingGreen.com.

Book Review

Storms of My Grandchildren: The Truth About the Coming Climate Catastrophe and Our Last Chance to Save Humanity

By James Hansen

Bloomsbury, 2009
304 pages, \$25.00 (Hardcover)

Reviewed by Debra Simes

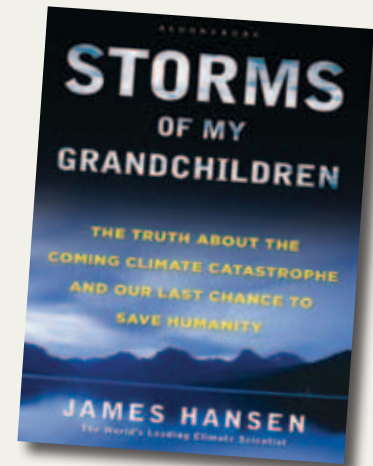
James Hansen likely never expected to write this book. Preeminent climate scientist, adjunct professor at Columbia University, and director of NASA's Goddard Institute for Space Studies, Hansen is most comfortable in his lab. Doing public speaking, high-level meetings, and now, the author's tour—not so much. Early on, he believed that presenting the science would be sufficient to trigger rational policy on global warming. But in the face of political greenwashing, in which politicians say the right things but don't follow through with necessary action, obfuscation of the science by “denialists,” and the outsize role of money in politics, Hansen has repeatedly gone beyond his comfort zone to make the case for urgent reduction of human-caused carbon dioxide emissions. The birth of his first grandchild was his personal tipping point: “I didn't want my grandchildren to say, ‘Opa understood what was happening, but he didn't make it clear.’” *Storms* is his epic effort to do exactly that.

Using paleoclimatic data to demonstrate Earth's climate sensitivity, the book conducts a digestible mini-course in the complex dynamics of planetary warming. We're brought to understand how seemingly small

temperature changes can spell eventual havoc: sea level rises that would displace billions, devastating species loss, and ever-more-riotous weather lead the list. Hansen recently revised his previous assessment of the safe ceiling for atmospheric CO₂, based on emerging data on accelerating rates of glacial melting and methane release, as well as improved understanding of ice sheet dynamics and the hellish scenario that their potential collapse represents. From our current atmospheric CO₂ level of 387 parts per million, we must aim for 350 ppm, or his—and all—grandchildren “are in for a rough ride.”

Hansen says that stabilizing climate will be a monumental task, but we have no choice. He insists that the only realistic ways to bring CO₂ emissions down to a safe range include: the rapid phase-out of coal as fuel; a Manhattan Project-like investment in renewables; development of fourth-generation nuclear power; and a global, gradually rising fee on carbon fuels at their source. On this last point, he's taken environmental groups to task for their support of the Waxman-Markey bill (which includes a cap-and-trade strategy, deemed by Hansen as wholly inadequate to the emissions-reduction challenge), and said that the December 2009 UN climate summit in Copenhagen, with its potential Kyoto-style, cap-and-trade-based agreements, was doomed to failure. The business-as-usual approach that operates via compromise just can't have a place in stabilizing climate: “Nature and the laws of physics cannot compromise—they are what they are.”

The book is part resolute transmission of climate-change science; part apology; part castigation of moneyed special interests in US politics; and, because of that last, part impassioned plea for the public to understand and



act. Hansen occasionally reveals his very human grief over our plight. After colliding with a deer one night on the return from yet another maddening attempt to get the powerful to do what's necessary, he tells us, “At age sixty-three, for the first time since childhood, I burst into tears. I am not sure if I was crying for the deer, the nation, or the planet.”

Hansen voices optimism that we can still pull out of our climate entropy. But given the machinations of US politics—which he regards as harnessed to the will of (primarily corporate) special interests, and barely a hair's breadth away from malfeasance—he says, “Civil resistance may be our best hope.” The reader discerns the grim reckoning in Hansen's message: we cannot now expect governments and politicians to do the right thing. It is up to us. And “it is our last chance.” ■

Debra Simes is a Massachusetts-based writer and editor who works on (and writes about) issues in environmental and human health, food and agriculture, and democratic civic engagement.

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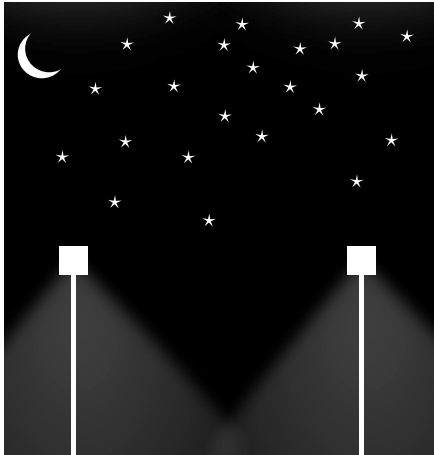
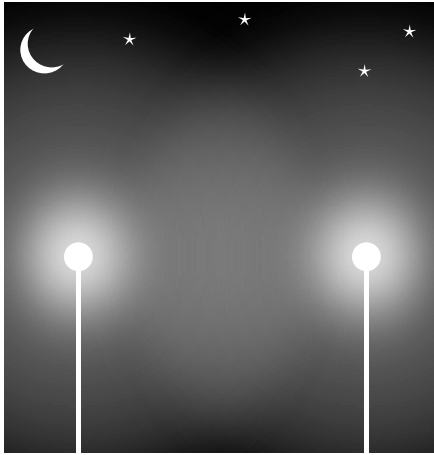


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Book Review

Plan B 3.0: Mobilizing to Save Civilization

By Lester R. Brown

W.W. Norton & Co., 2009
368 pages, \$29.95 (Hardcover)
or free download

Reviewed by Joel N. Gordes

Lester Brown, author or co-author of over 50 books and innumerable articles is no stranger to those who have been actively involved in resource conservation and environmental preservation. He may be best known as the founder of Worldwatch Institute, which, since 1974 has been one of the more cutting edge groups involved in what today is known as “sustainability.” Under his leadership, they offered such heavy-duty research in their *State of the World* and *Vital Signs* annual volumes.

Most important, these books explored the impacts of environmental degradation far beyond the environment and into the realms of social interactions at local, national and international levels. After many years at Worldwatch, Brown left in 2001 to found the Earth Policy Institute to develop a platform for his passionate and profoundly urgent message. *Plan B: Mobilizing to Save Civilization* is both that platform and the message. *Plan B* is not just a book, but, rather, a series of books labeled similar to computer operating systems as Plan B, Plan B, 2.0 etc. that provide updates to the predominant themes.

Antoine de Saint Exupery, the famous French author, once noted, “A goal without a plan is just a wish,” and what Brown provides is a plan that even with some imperfections is further along in its holistic approach

than most. The goal in this case is to cut carbon emissions not 80% by 2050 as espoused by many top scientists BUT to go one better and cut by 80% by 2020. Bold and ambitious to be sure and, while open to many criticisms, Brown goes into extraordinary detail to describe what must be done, why we must do it and even how to accomplish it.

The book is divided into three major parts. Part I, “A Civilization in Trouble,” provides a litany of the many environmental and social problems that have come to a confluence in the last decade that demand action. It is in this section he introduces a basic concept that is continued throughout—the climate change driven stresses to the environment lead to food insecurity, massive migration, political instability, failed states and national/international security issues.

Part II, “The Response.” *Plan B* goes into the many solutions with education, population stabilization, reforestation/afforestation, water, food production, urbanization, diversity, and energy in the forefront. It is in this section, though, where he makes one major statement that is both brilliant but also naïve enough that it detracts from the plan. He says:

“The Plan B goals for developing renewable sources of energy by 2020 that are laid out in this chapter are based not on what is conventionally believed to be politically feasible, but on what we think is needed to prevent irreversible climate change. This is not Plan A business as usual. This is Plan B—a wartime mobilization, an all-out response proportionate to the threat that global warming presents to the future. (At page 238)”

To ignore what may not be politically feasible is to relegate much of the value of the plan to it becoming more of the “wish” that St. Exupery spoke of. The

plan needs to be further fleshed out so as not discount the politics but to determine how to make better arguments to change them to accept what must be done.

But it is in the scant 20 pages that make up Part III, “An Exciting New Option,” where Brown really shines when he offers not just one option but several working hand-in-hand leading to “The Great Mobilization.” He offers the example of the focused and direct actions by Americans during WWII to meet the largest security threat up to that time. He recounts the shared sacrifices to support that effort—sacrifices of a scale not seen since. In short he calls for a wartime efforts to meet environmental challenges.

Equating environmental action to armed conflict would not entail the militarization of the environmental movement as some have feared, but the reverse, the ecological transformation of the military. He daringly advocates a tax shifting proposal that would tax carbon rather than wages to fuel these efforts, a position that may attract a new base to renewables. (Some may be aware that a group of NESEA members has long advocated this and it has been a topic at NESEA conferences.)

This book is rich in strategy and reasoning and we can only hope that some more refinement on the political tactics will be developed in *Plans B 5.0, 6.0*—and beyond. Time is the most unrenowned resource of all.

Plan B may be downloaded at no cost at: www.earth-policy.org/images/uploads/book_files/pb3book.pdf. ■

Joel Gordes has worked in passive and active solar R&D, design, and sales.



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Tel: 617-242-2150
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hkv@solarwave.com
www.basea.org

Building For Social Responsibility (BSR)

Tom Perry
P.O. Box 614
Burlington, VT 05461
tsperry@gmavt.net
www.bsr-vt.org

Cape and Islands Renewable Energy Collaborative (CIReNew)

Chris Powicki
Tel: 774-487-4614
chrisp@weeinfo.com
Joan Muller
Tel: 508-457-0495 x 107
joan.muller@comcast.net
www.cirenew.org

Central Jersey Sustainable Energy Association

Beth Robinson
732-695-2578
nesea.nj@gmail.com

GreenHome NYC

Steven Lenard
Tel: 917-846-2374
slenard@GreenHomeNYC.org
www.greenhomenyc.org

Maine Solar Energy Association (MESEA)

Richard Komp
17 Rockwell Rd. SE
Jonesport, ME 04649
Tel: 207-497-2204
sunwatt@juno.com
www.mainesolar.org

NH Sustainable Energy Association (NHSEA)

Madeline McElaney
54 Portsmouth Street
Concord, NH 03301
Tel: 603-226-4732 (22NHSEA)
madeline@nhsea.org
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Philadelphia Solar Energy Association (PSEA)

Kira Costanza
80 Pechins Mill Rd.
Collegeville, PA 19426
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kira@sunpowerbuilders.com

RI Solar Energy Association (RISEA)

Domenic Bucci
42 Tremont Street
Cranston, RI 02920
Tel: 401-942-6691
solarenergyone@yahoo.com

Solar Energy Association of CT (SEAC)

K. Raman, Ph.D.
43 Alderwood Dr.
West Hartford, CT 06117
Tel: 860-233-5684
Ramank0@yahoo.com
www.SolarEnergyOfCT.org

Sustainable Delaware

John Mateyko AIA
304 Pilottown Road
Lewes, DE 19958-1230
Tel: 302-645-2657
charitocw@aol.com

Springfield Area Sustainable Energy Association

Mike Kocsmiersky
P.O. Box 51924
Springfield, MA 01151
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John J. Duffy
1 University Avenue
Lowell, MA 01854
Tel: 978-934-2968
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john_duffy@uml.edu
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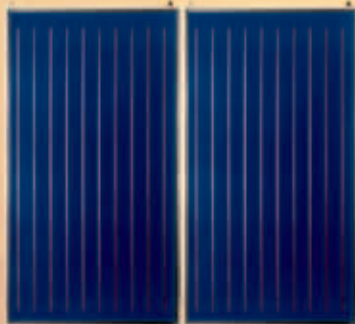
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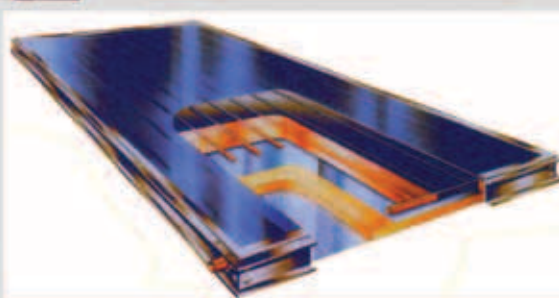
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